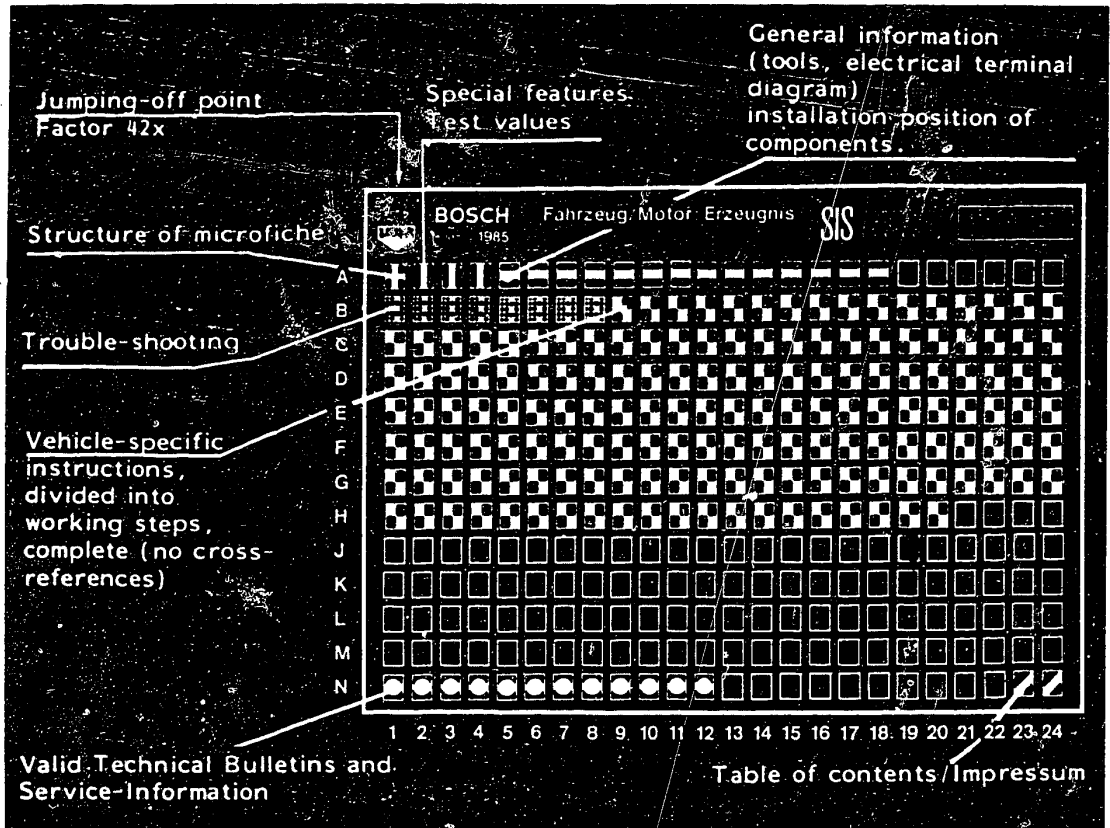


Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E 16	Product/assembly/test step	
	Vehicle/engine	

↑
Coordinate

3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C 6

A1

Trouble-Shooting Plan



1. Special features

The following vehicle models with 5/6-cylinder diesel engines are dealt with in this microcard:

Volvo 240D (4.79 →)
Volvo 740D (3.84 →)
Volvo 760D-Turbo (8.82 →)

2. Test specifications

2.1 Idle speed:

D20,D24	$750 \pm 50 \text{ min}^{-1}$
D24T-1984	$750 \pm 50 \text{ min}^{-1}$
D24T 1985-	$830 \pm 50 \text{ min}^{-1}$

C13

2.2 Nozzle-opening pressure:

	D20,D24	D24T
Checking value:	120...140 bar	145...163 bar
Setting value:	130...138 bar	155...163 bar

C24

2.3 Filter test

Max. allowable differential
pressure: 0.3 bar

D7

2.4 Compression loss: Max. 25 %

E3**A2**

Test specifications

Volvo 240D, 740D, + 760D-Turbo



2.5 Injection timing:

Engine position:

Cyl. 1 at TDC

H5

Checking value:

Pump position: 0.75...0.83 mm ABDC (D20)

Pump position: 0.65...0.73 mm ABDC (D24)

Pump position: 0.87...0.95 mm ABDC (D24 Turbo)

Setting values:

Pump position: 0.80 mm ABDC (D20)

Pump position: 0.70 mm ABDC (D24)

Pump position: 0.90 mm ABDC (D24 Turbo)

2.6 Charge-air pressure

At 3000 min⁻¹ at full load 0.70...0.77 bar

H12

2.7 Overpressure valve

0.80...0.85 bar

2.8 Compression pressure

E3

Engine type	Compression pressure	Allowable difference between cylinders
D20/D24	28...34 bar	max. 5 bar
D24 Turbo	24...32 bar	max. 8 bar

A3

Test specifications

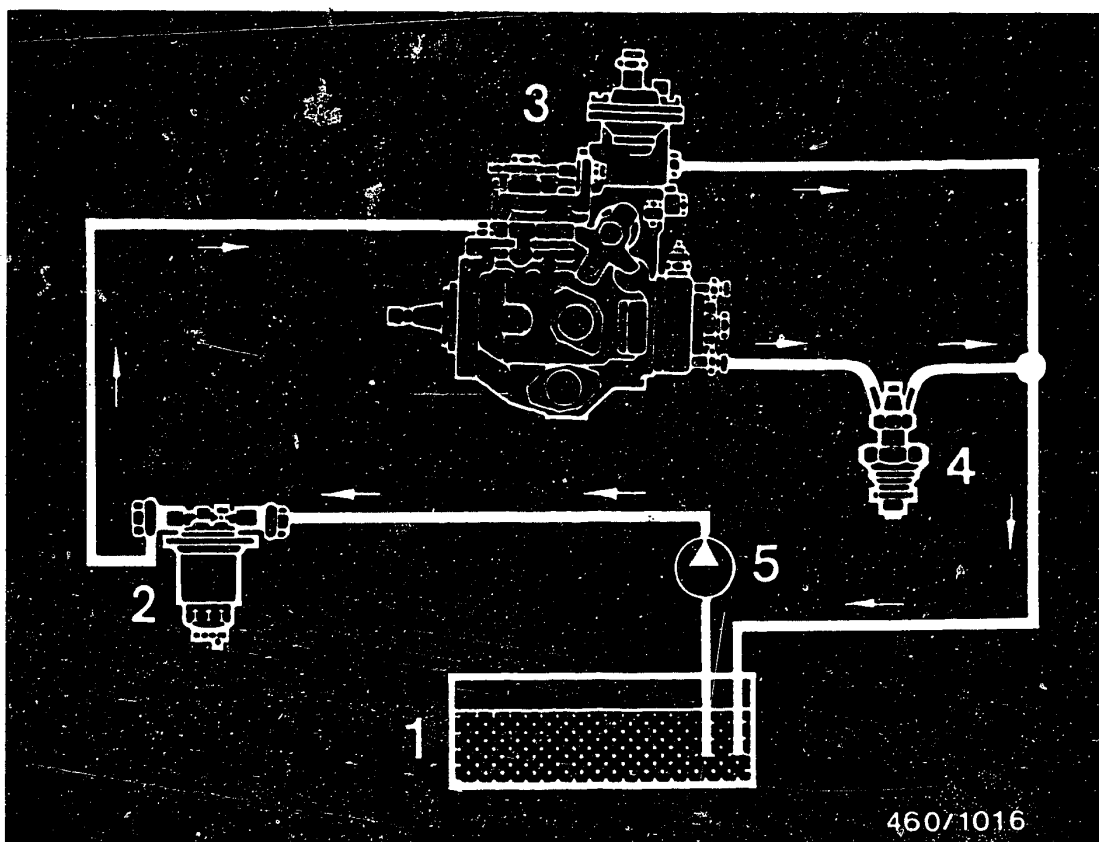
Volvo 240D, 740D, + 760D-Turbo



2.9 Tightening torques

Injection-pump gear	45 Nm
Fuel lines	25 Nm
Injection-pump fastening screws	25 Nm
Camshafts	45 Nm
Screw plug	15 Nm
Nozzle-holder fastening screws	70 Nm
Sheathed-element glow plugs	40 Nm
Camshaft gear	100 Nm
Bleeder screw	15 Nm
Injection-pump support bracket	25 Nm
Injection-pump bracket	65 Nm
Turbocharger - exhaust manifold	60 Nm
Muffler pipe - turbocharger	25 Nm
Turbine housing screws	20 Nm
Turbocharger housing screws	18 Nm





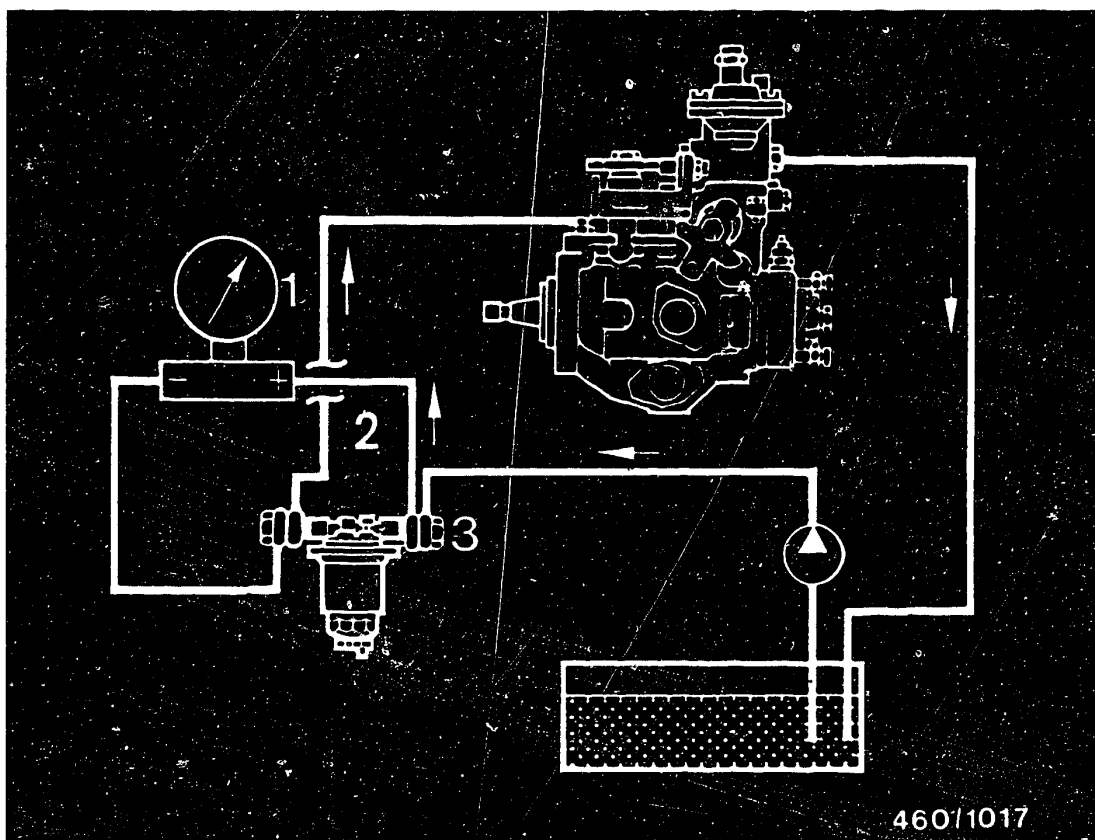
- 1 = Fuel tank
- 2 = Fuel filter
- 3 = Distributor-type fuel-injection pump
- 4 = Injection nozzles
- 5 = Pre-supply pump

3. DIAGRAM OF FUEL LINES

The fuel lines are connected as shown in the above diagram.

The fuel flows in the direction of the arrows.





- 1 = Differential-pressure gauge
- 2 = Filter outlet (use inlet union and extra-long inlet-union screw 2 443 456 020)
- 3 = Filter inlet (use inlet union and extra-long inlet-union screw 2 443 456 020)

3.1 Connection diagram for filter test

Connect differential-pressure gauge to fuel filter using appropriate connecting pieces.



4. Test equipment and tools

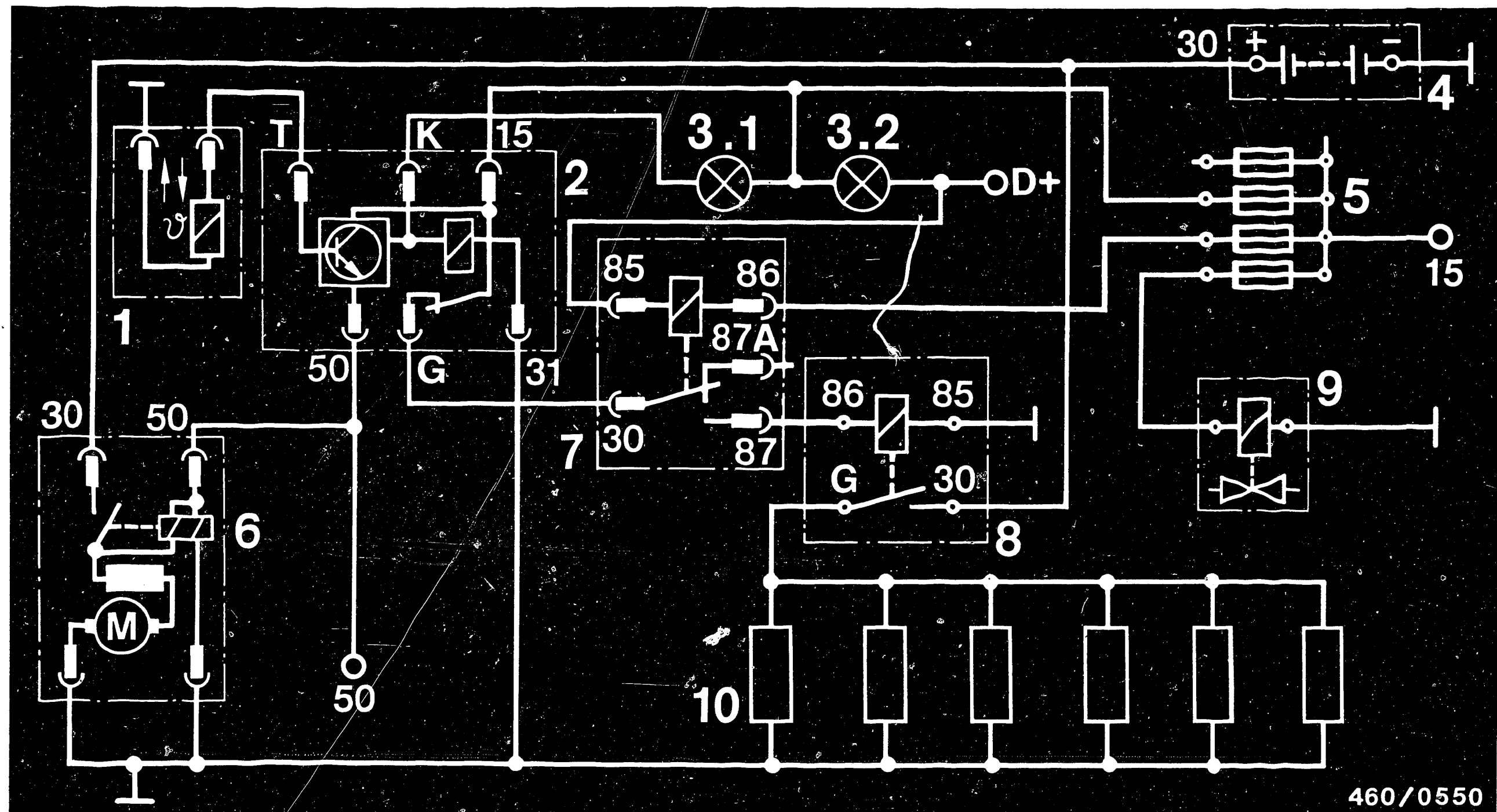
Designation	Part No.	Use
Puller	KDEP 1118	Removing injection-pump gear
Locating mandrel	KDEP 1122	Locking the injection-pump gear
Holder	KDEP 1116	For locking the camshaft gear
Toothed-belt tester	KDEP 1121	Testing tension of toothed belt
Setting rule	KDEP 1117	Locating the camshaft
Box wrench	KDEP 1115	Loosening/tightening injection lines
Measuring tool	KDEP 1085	
Mini dial indicator 1/100 mm divisions	Commercially available e.g. Hahn & Kolb 7000 Stuttgart Part No. 33 003 with adapter KDEP 1127	Injection timing
Box wrench	KDEP 1120	For tightening the camshaft gear
Pressure tester, or pressure gauge 0...1.6 bar	KDJE-P 100 e.g. Wika No. 4184	Testing the charge-air pressure



Test equipment and tools (continued)

Description	Part Number	Use
Nozzle tester	EFEP 60 H 0 681 200 502	Testing injection nozzles
Compression-loss tester	EFAW 210 A 0 681 001 901	Testing engine compression loss
Tachometer	commercially available e.g. Dr.E.Horn GmbH Meßgerätefabrik Postfach 40 7036 Schönaich Order Desig: HT 446 (with digital display)	Adjusting engine speed
Differential-pressure gauge	commercially available Part No. NG 160/311-911 -1.0+4.0 bar Haenni Nauheimer Str. 78-80 7000 Stuttgart 50	Filter test
Evaluation unit Accessory box w. metering unit	0 684 102 050 0 681 169 038	Smoke test
Compression tester	Commercially available	Testing engine compression
VA tester	ETT 011.00 0 684 101 100	Testing preheating system





460/0550

5. Terminal diagram of preheating system, Volvo 240 D (1978 - 1980)

- | | | |
|--|--------------------|-----------------------------|
| 1 = Temperature sensor | 4 = Battery | 7 = Cutoff relay |
| 2 = Glow-duration unit | 5 = Fuse board | 8 = Power relay |
| 3.1 and 3.2 = Preheating repeater lamp | 6 = Starting motor | 9 = Solenoid-operated valve |
| | | 10 = Glow plugs |

Cutoff relay (7) is shorted to ground through regulating switch/generator when generator is not charging.

A9

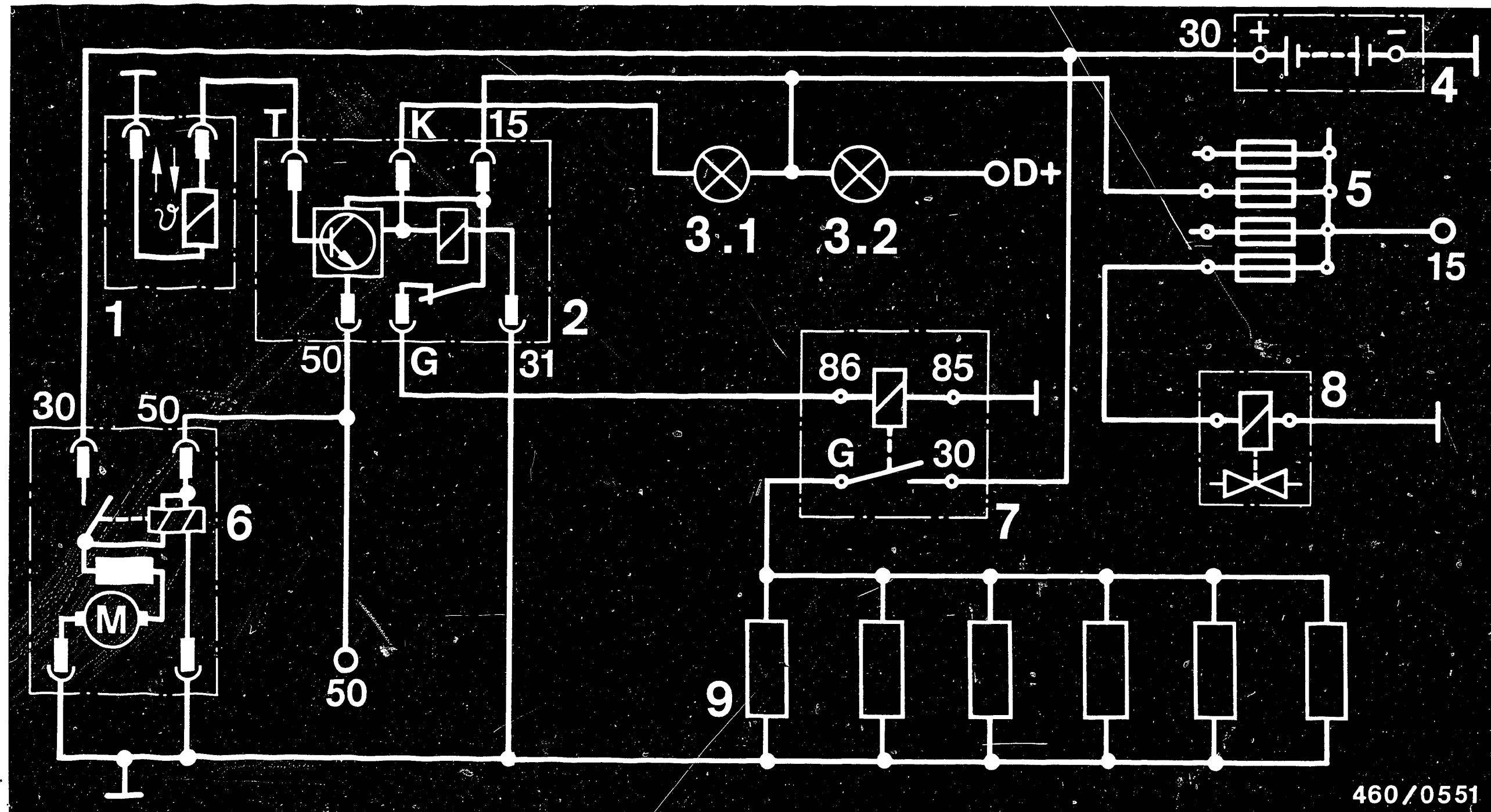
Terminal diagram - preheating system
Volvo 240D, 740D, + 760D-Turbo



A10

Terminal diagram - preheating system
Volvo 240D, 740D, + 760D-Turbo





460/0551

Terminal diagram of preheating system, Volvo 240 D (1981 -)

- | | | | |
|-------------|----------------------------|---|------------------|
| 1 | = Temperature sensor | 4 | = Battery |
| 2 | = Glow-duration unit | 5 | = Fuse board |
| 3.1 and 3.2 | = Preheating repeater lamp | 6 | = Starting motor |

- | | |
|---|---------------------------|
| 7 | = Power relay |
| 8 | = Solenoid-operated valve |
| 9 | = Glow plugs |

A11

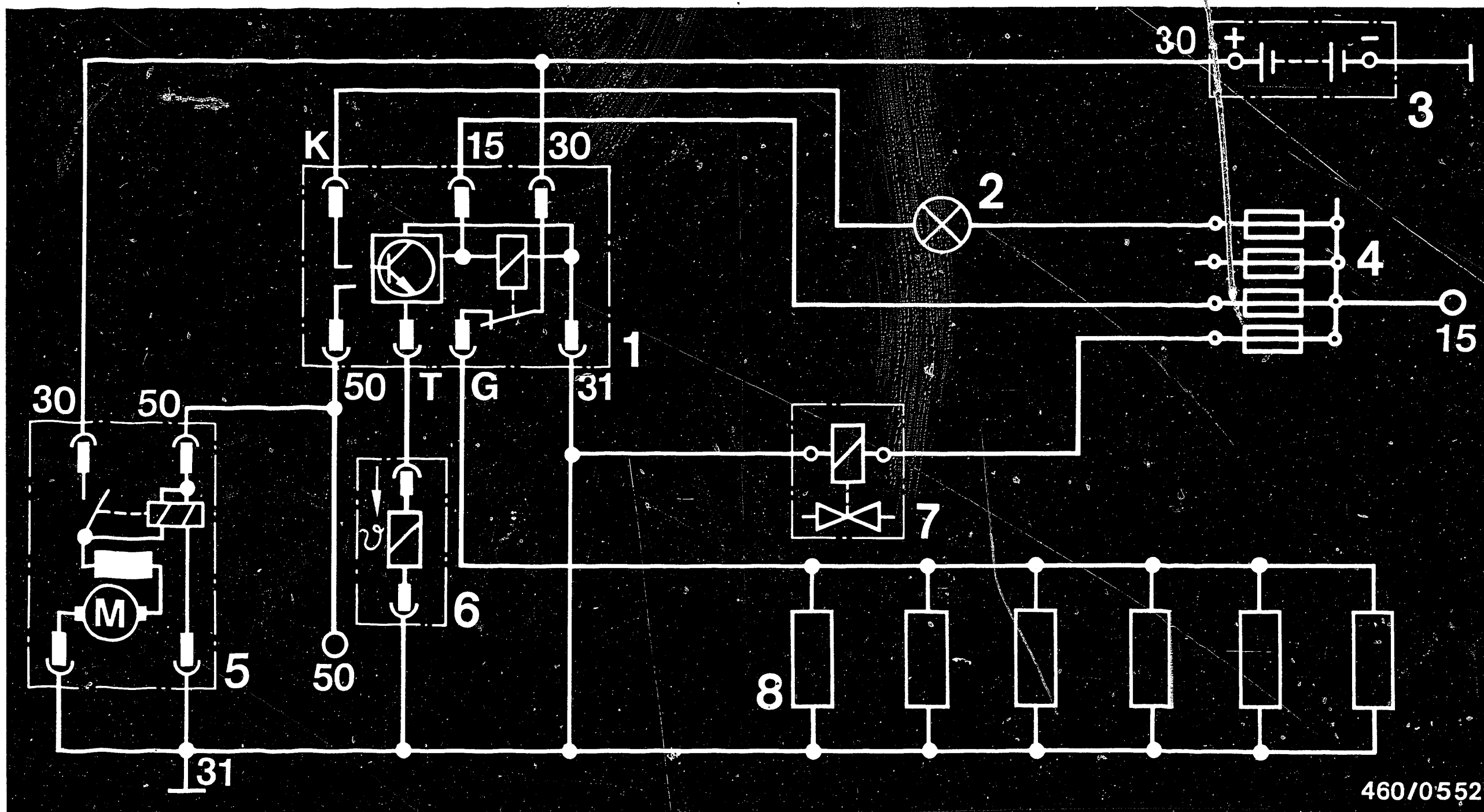
Terminal diagram - preheating system
Volvo 240D, 740D, + 760D-Turbo



A12

Terminal diagram - preheating system
Volvo 240D, 740D, + 760D-Turbo





Terminal diagram of preheating system (Volvo 740D/760D-Turbo (8.82+))

- | | | |
|------------------------------|------------------------|-----------------------------|
| 1 = Glow-duration unit | 4 = Fuse board | 7 = Solenoid-operated valve |
| 2 = Preheating repeater lamp | 5 = Starting motor | 8 = Glow plugs |
| 3 = Battery | 6 = Temperature sensor | |

A13

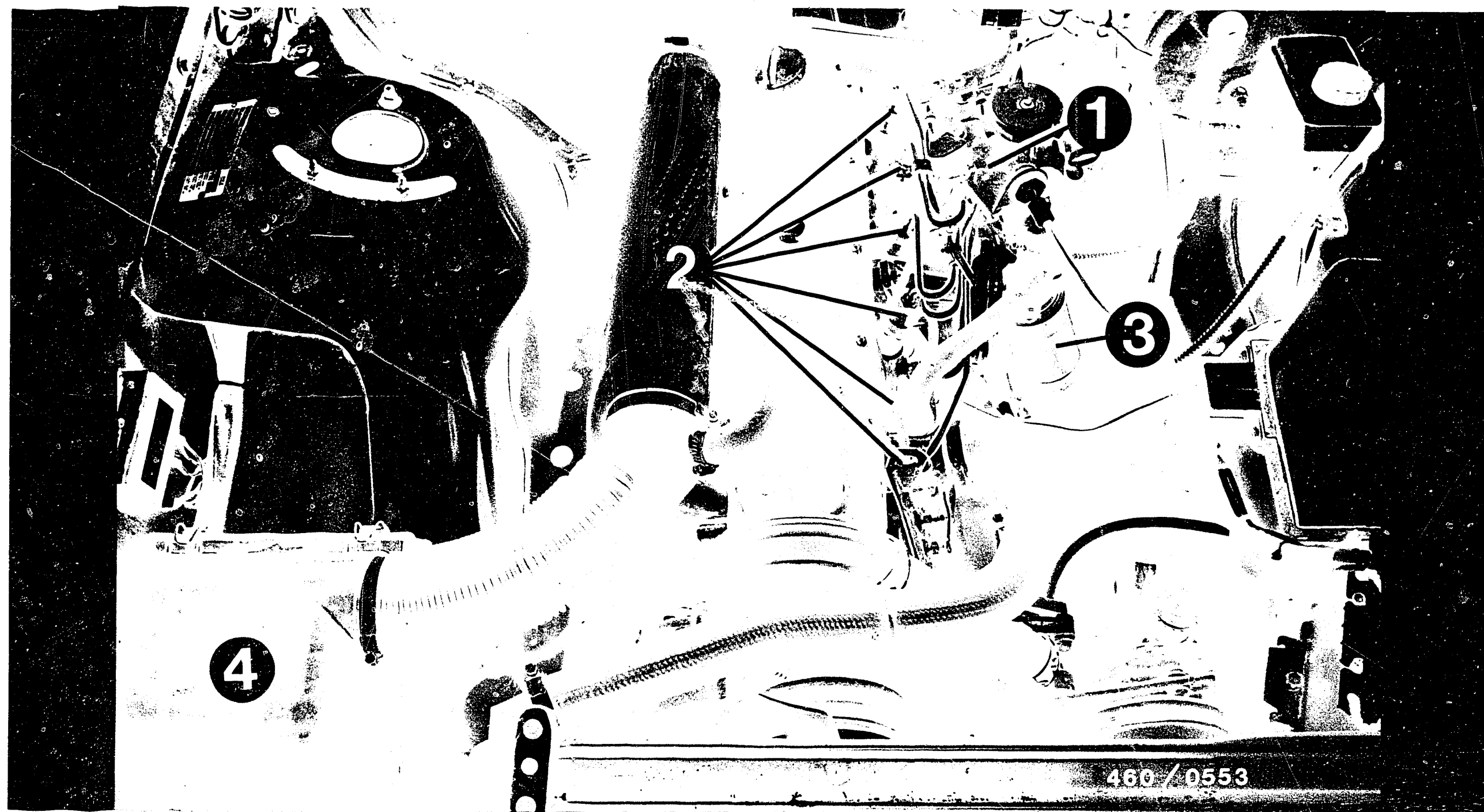
Terminal diagram - preheating system
Volvo 240D, 740D, + 760D-Turbo



A14

Terminal diagram - preheating system
Volvo 240D, 740D, + 760D-Turbo





6. Installation position of components (Volvo 240 D / 740D)

1 = Injection pump

2 = Injection nozzles

3 = Fuel filter

4 = Air filter

A15

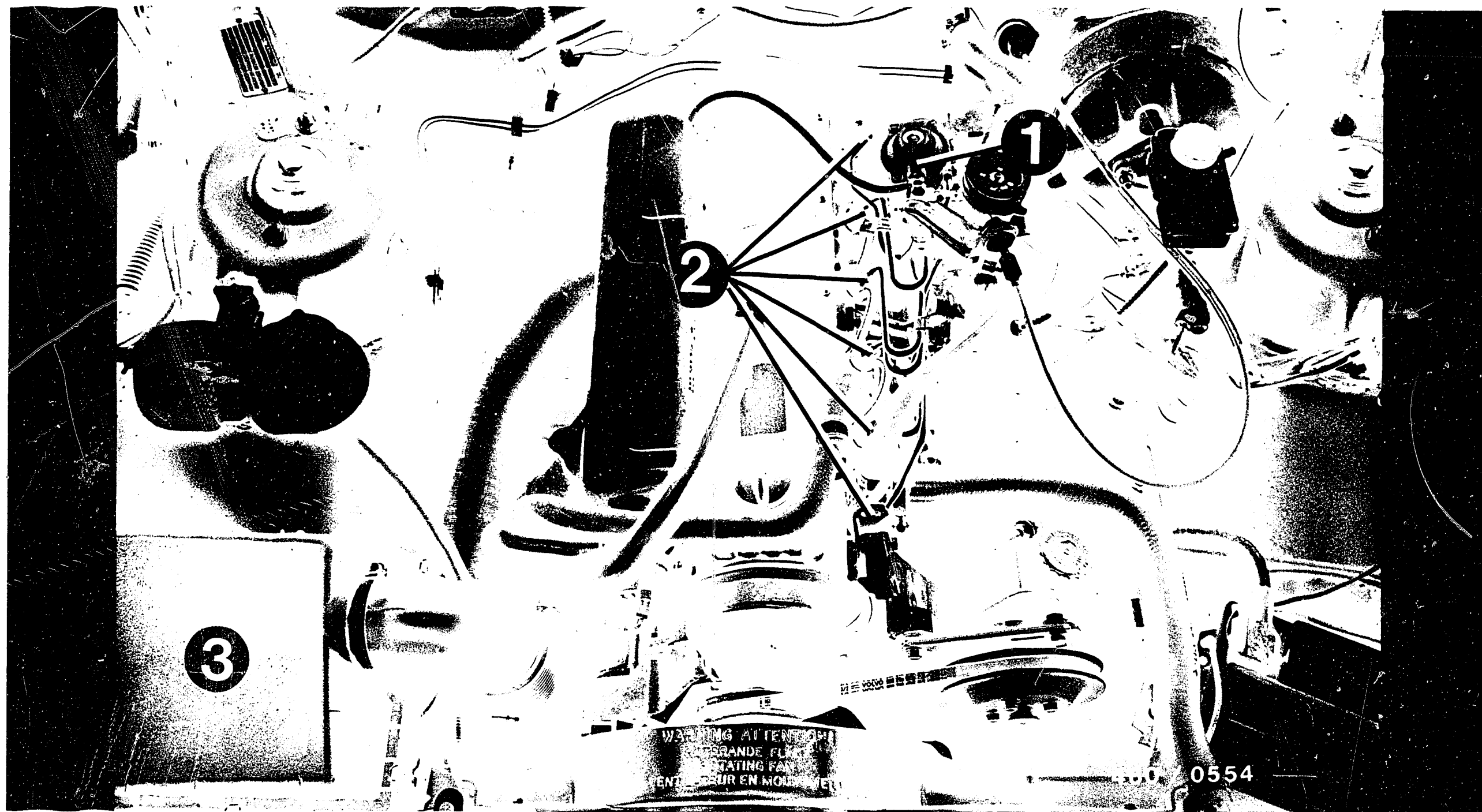
Installation position of components
Volvo 240D, 740D, + 760D-Turbo



A16

Installation position of components
Volvo 240D, 740D, + 760D-Turbo





Installation position of components (Volvo 760 Turbo)

1 = Injection pump

2 = Injection nozzles

3 = Air filter

A17

Installation position of components
Volvo 240D, 740D, + 760D-Turbo



A18

Installation position of components
Volvo 240D, 740D, + 760D-Turbo



7. TROUBLE-SHOOTING

Customer complaint (fault symptom)

1. Engine fails to start or starts only with great difficulty when warm						Cause (component fault)	Coordinates
2. Engine fails to start or starts only with great difficulty when cold							
3. Engine hunts at idle							
4. Rough idle when engine warm							
5. Engine missing during vehicle operation							
6. Unsatisfactory performance							
●	●			●	●	Tank empty; tank vent clogged	B 9
●	●			●	●	Injection lines clogged or constricted (check fuel lines)	C 1
	●		●			Injection sequence does not correspond to firing sequence (check routing of fuel-injection tubing)	B 11
				●		Overflow restriction clogged	B 12
●	●					Shutoff device defective	B 13
		●		●	●	Inlet-union screws of inlet and return lines clogged (see diagram of fuel lines)	B 17
●	●		●	●	●	Air in fuel system	B 19
	●					Heavy paraffin deposits in filter in winter operation (replace filter box)	B 22
●	●			●	●	Lines leaking or broken; connections loose	C 1
●	●			●	●	Supply lines clogged (check fuel lines)	C 4

B1

Trouble-shooting

Volvo 240D, 740D, + 760D-Turbo



B2

Trouble-shooting

Volvo 240D, 740D, + 760-Turbo



Trouble-shooting (continued)

1. Engine fails to start or starts only with great difficulty when warm						Cause (component fault)	Coordinates
2. Engine fails to start or starts only with great difficulty when cold							
3. Engine hunts at idle							
4. Rough idle when engine warm							
5. Engine missing during vehicle operation							
6. Unsatisfactory performance							
					●	Engine air filter clogged	C 5
			●			Idle speed incorrect	C 13
●	●		●		●	Injection nozzle defective	C 24
	●		●		●	Timing of pump to engine incorrect	H 5
●	●			●	●	Fuel filter (differential-pressure test)	C 4
	●					Preheating system defective	D 10
					●	Timing device defective	E 2
	●		●			Engine compression poor or uneven	E 3
					●	Maximum engine speed incorrectly set (remove injection pump)	E 16
●	●	●	●	●	●	Injection pump (governor) defective or out of adjustment (remove injection pump)	E 16
					●	Check turbocharger for leaks and charge-air pressure	H 12

B3

Trouble-shooting
Volvo 240D, 740D, + 760D-Turbo



B4

Trouble-shooting
Volvo 240D, 740D, + 760D-Turbo



Trouble-shooting (continued)

7. Insufficient engine power in conjunction with high fuel consumption, possibly smoking							
8. Engine cannot be stopped							
9. Engine runs rough, in conjunction with black smoke at full load; possibly lack of power							
10. Fog-like smoke at full load (white)							
11. Incorrect engine speeds							
12. Engine will not rev up when cold							
13. Distributor-type fuel-injection pump overheating							
<u>Cause</u> (component fault)							<u>Coordinates</u>
			●		●		Supply lines clogged (check fuel lines) D 7
			●		●		Injection lines clogged or constricted (check fuel lines) D 7
		●					Engine air filter clogged C 5
				●			Idle speed incorrect C 13
		●					Injection nozzle defective C 24
●		●	●		●		Timing of pump to engine incorrect H 5
			●		●		Fuel filter clogged (differential-pressure test) D 7
		●	●				Timing device defective (remove injection pump) E 16
●					●		Engine compression poor or uneven E 3
				●			Maximum engine speed incorrectly set (remove injection pump) E 16
●	●	●	●	●	●	●	Injection pump (governor) defective or out of adjustment (remove injection pump) E 16

B5

Trouble-shooting
Volvo 240D, 740D, + 760D-Turbo



B6

Trouble-shooting
Volvo 240D, 740D, + 760D-Turbo



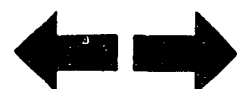
Trouble-shooting (continued)

7. Insufficient engine power in conjunction with high fuel consumption, possibly smoking							
8. Engine cannot be stopped							
9. Engine runs rough, in conjunction with black smoke at full load; possibly lack of power							
10. Fog-like smoke at full load (white)							
11. Incorrect engine speeds							
12. Engine will not rev up when cold							
13. Distributor-type fuel-injection pump overheating							
Cause							
Coordinates							
			●		●	Tank empty; tank vent clogged	B 9
					●	Engine timing out of adjustment	G 12
		●		●	●	Injection sequence does not correspond to firing sequence (check routing of fuel-injection tubing)	B 11
						● Overflow restriction clogged	B 12
	●					Shutoff device defective	B 13
		●	●	●		Inlet-union screws of inlet and return lines clogged (see diagram of fuel lines)	C 4
		●		●		Air in fuel system	B 19
				●		Heavy paraffin deposits in filter in winter operation (replace filter box)	B 22
●						Lines leaking or broken; connections loose	C 4

B7

Trouble-shooting

Volvo 240D, 740D, + 760D-Turbo

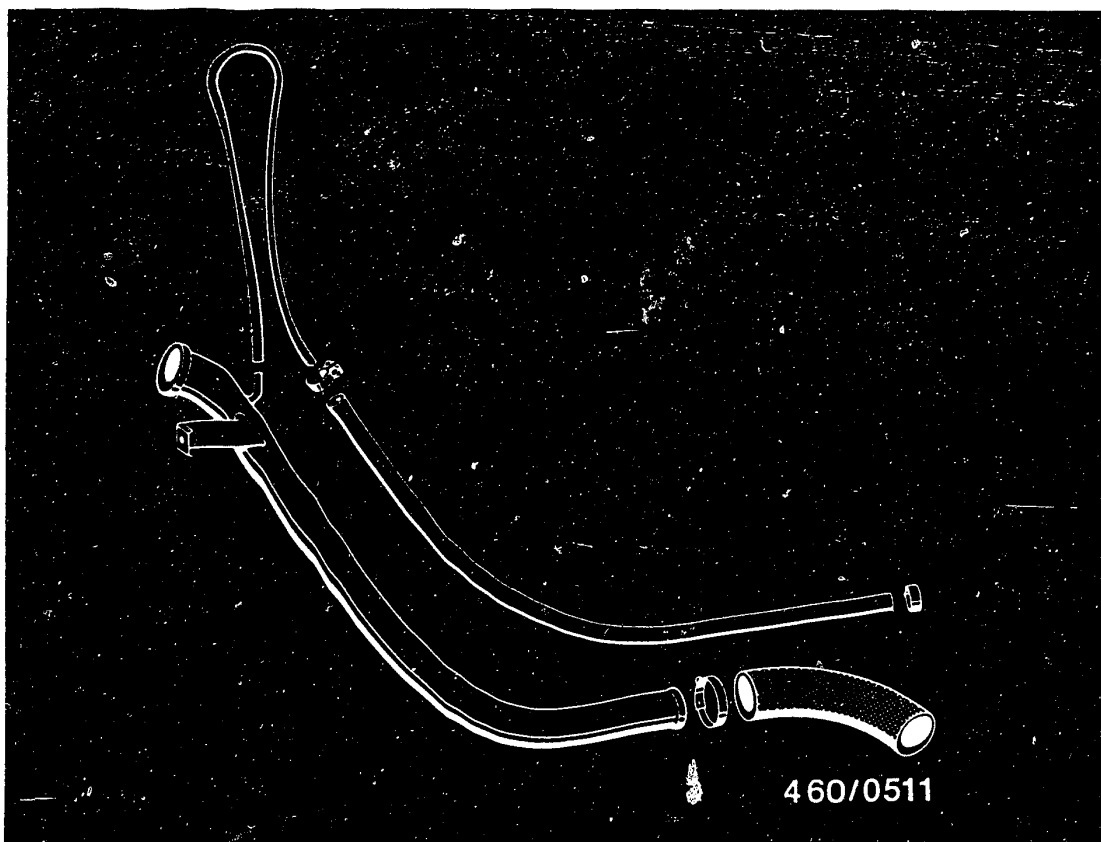


B8

Trouble-shooting

Volvo 240D, 740D, + 760D-Turbo



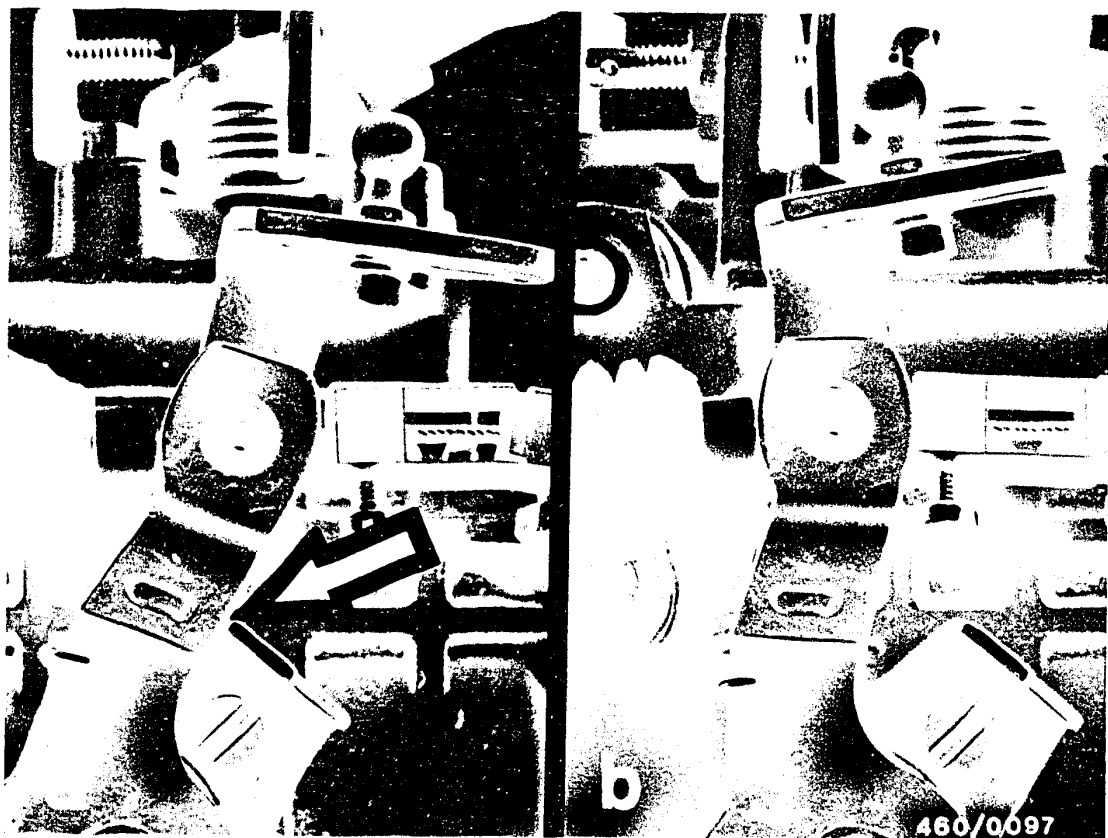


8. Check tank vent

Open filler cap.

If the fault disappears after opening the filler cap, the tank vent is defective.

Check the tank vent for clogging.

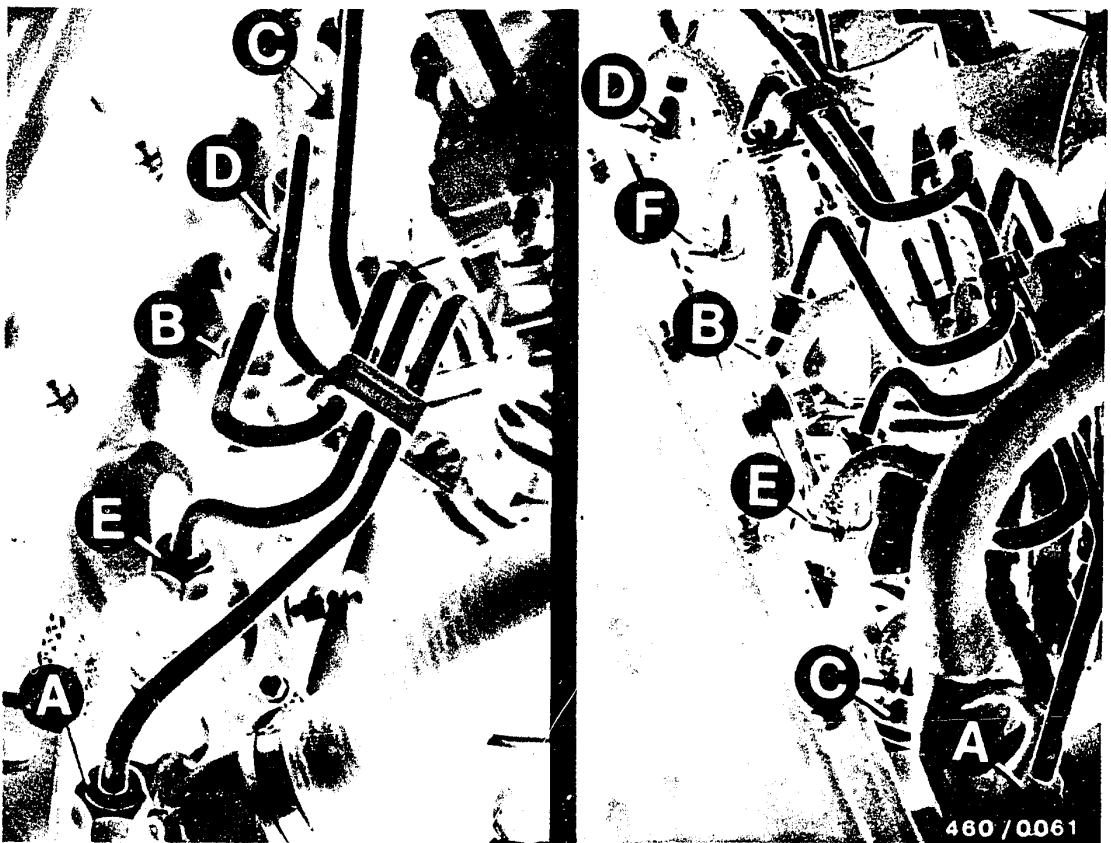


9. Test operation of temperature-controlled cold-start accelerator

If the cold-start accelerator is correctly set, with the engine at normal operating temperature (coolant temperature approx. 80°C) the control lever of the cold-start accelerator must be up against the stop bracket (picture a - arrow).

When the engine is cold, the control lever of the cold-start accelerator has reached its maximum working stroke (picture b).

If, when cold, the control lever remains up against the stop bracket or makes only a short stroke, it is necessary to remove and reset the injection pump.



10. Check routing of fuel-injection tubing

The injection lines are joined together by clamps so that it is impossible to mix up the outlets.

If, nevertheless, there is uncertainty, check the routing of the lines in accordance with the above picture.

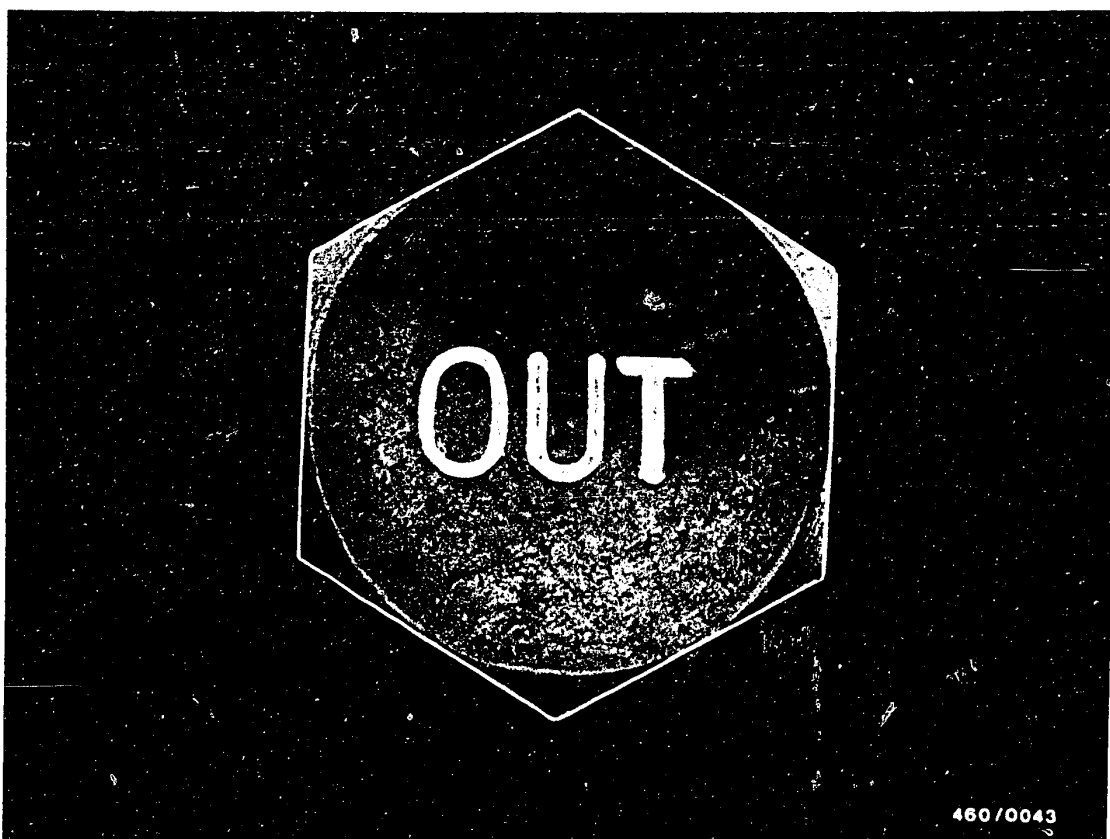
On the 5-cylinder engine the letters A...E identify which injection-pump outlets belong to which cylinders (picture a), and on the 6-cylinder engine, the letters A...F (picture b) identify which outlets belong to which cylinders.

B11

Check routing of fuel-injection tubing

Volvo 240D, 740D + 760D-Turbo





11. Check overflow restriction

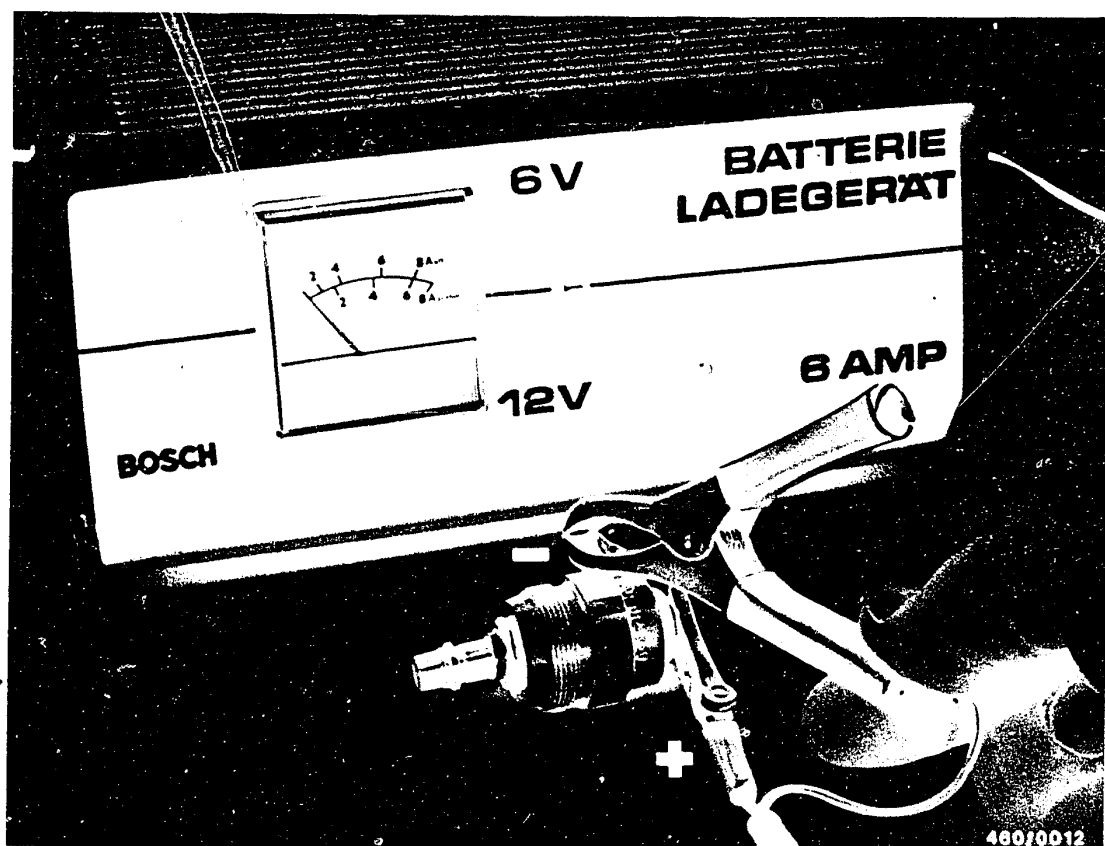
Unscrew overflow restriction on fuel-injection pump (marked "out").

Perform visual inspection of wire screen for impurities. If in doubt, replace overflow restriction.

B12

Check overflow restriction
Volvo 240D, 740D + 760D-Turbo





12. Check operation of shutoff device

12.1 Engine fails to start

Check whether solenoid-operated valve is supplied with voltage (min. 10 V) with glow-plug and starter switch switched on (drive position).

If voltage is present, remove fuel-injection tubing and take out solenoid-operated valve.

Cleanliness is essential.

When removed, check operation of solenoid-operated valve.

Note:

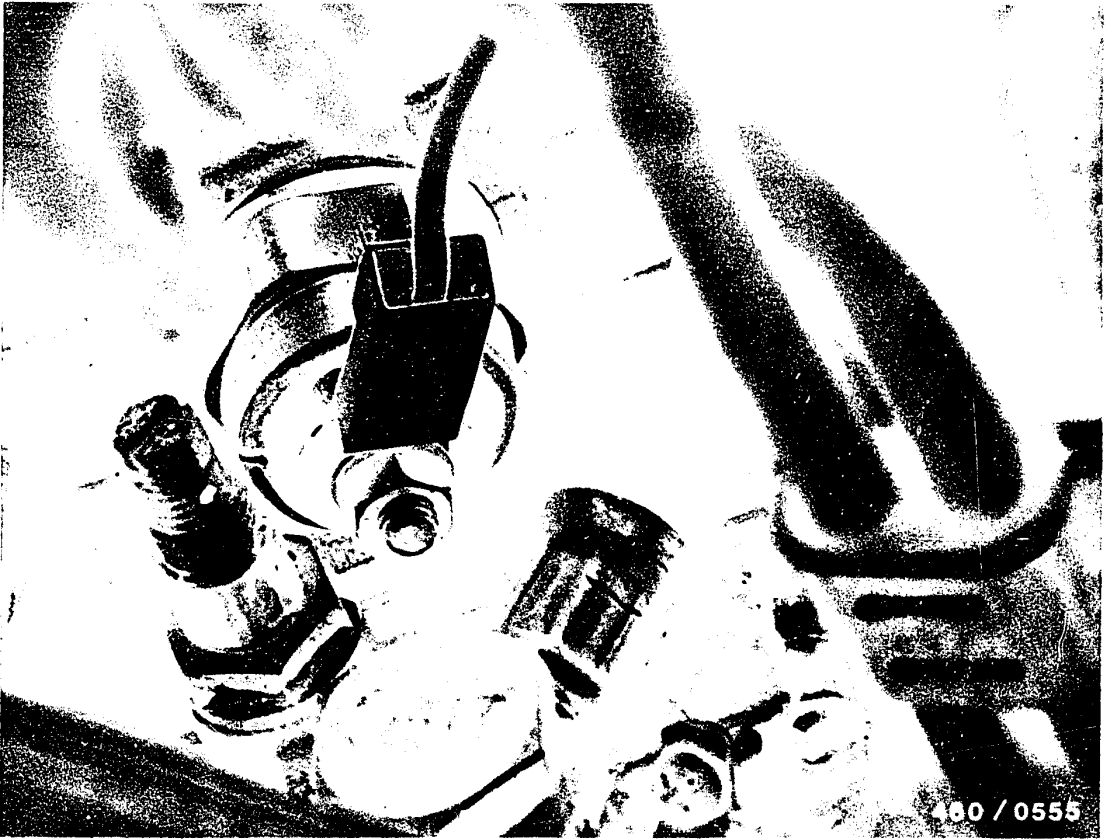
When removed, the solenoid-operated valve must only be supplied with voltage for a short period of time since it is no longer being cooled by the fuel.

B 13

Check shutoff device

Volvo 240D, 740D + 760D-Turbo





12.2 Engine cannot be switched off

With the glow-plug and starter switch in the stop position, there must be no voltage across the solenoid-operated valve, i.e. the fuel inlet at the distributor-pump plunger is interrupted.

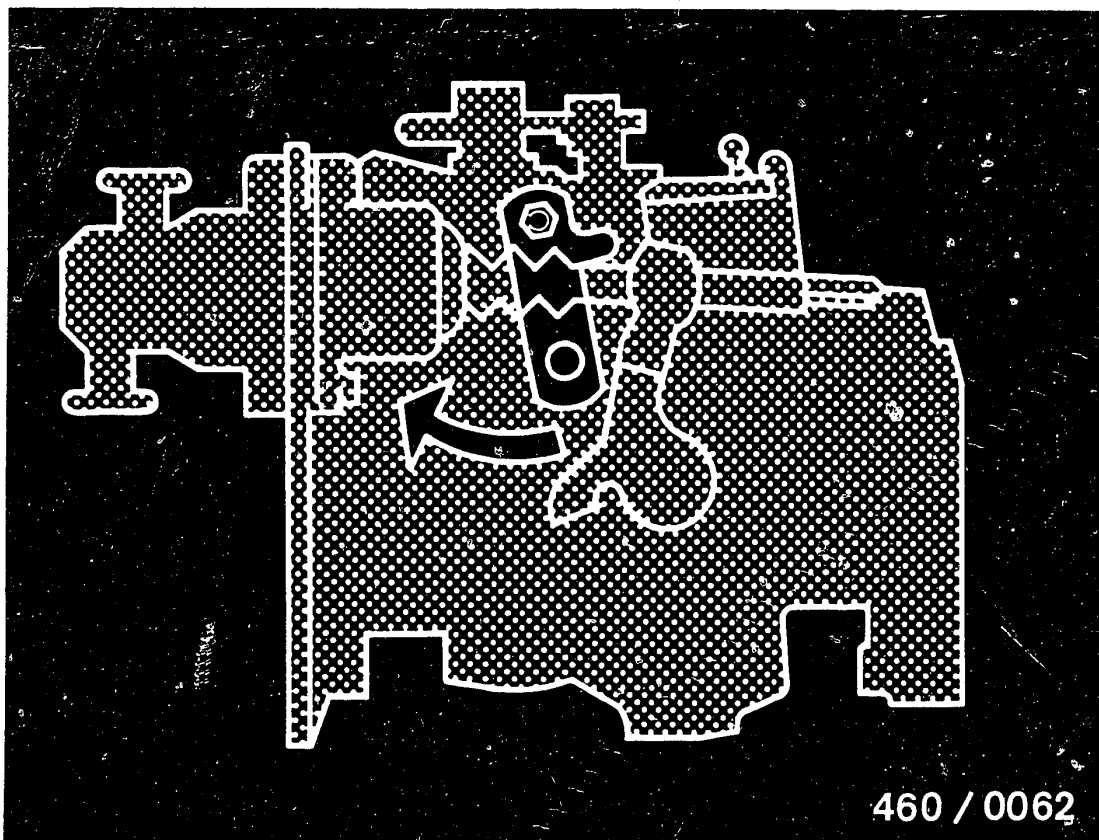
If the engine continues to run although there is no voltage across the solenoid-operated valve, the engine can be switched off as follows:

- Vehicles with manually-shifted transmission

Select 3rd or 4th gear.

Step firmly on foot brake and let out clutch.





- Vehicles with automatic transmission

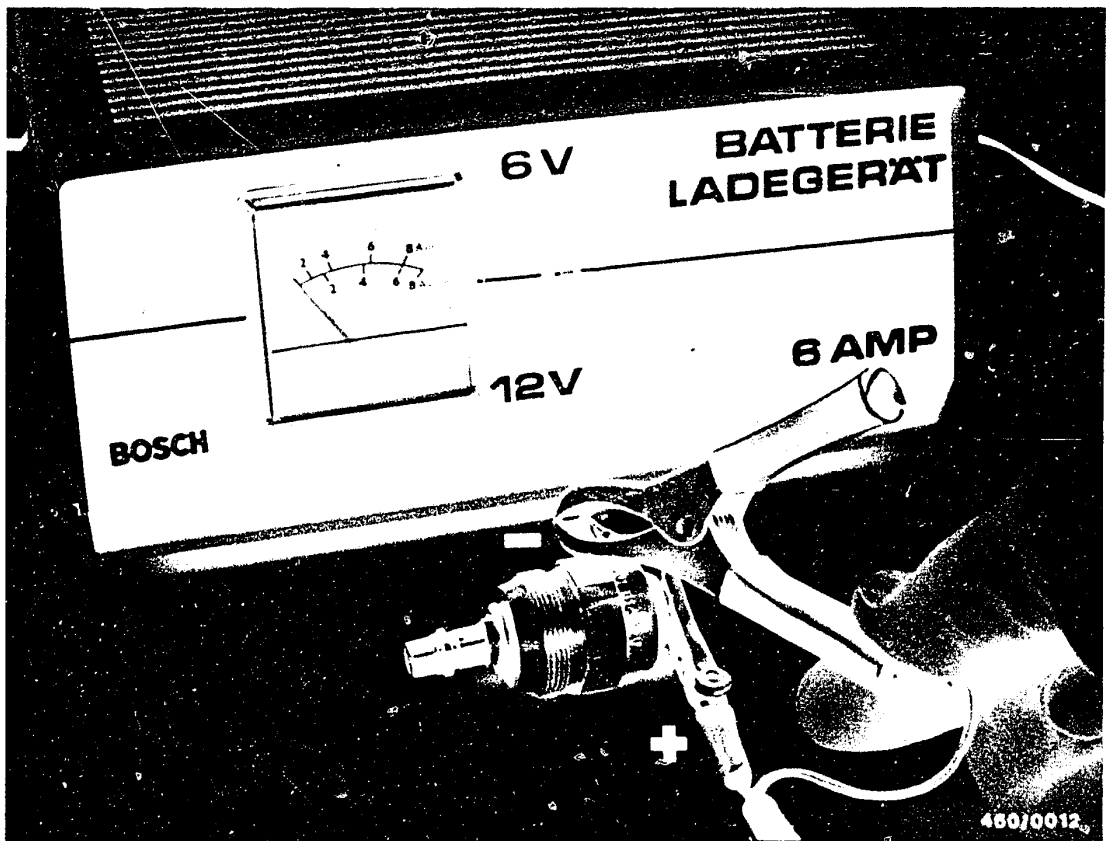
Operate emergency stop lever on injection pump (picture).

B 15

Test shutoff device

Volvo 240D, 740D + 760D-Turbo





12.2.1 Solenoid-operated valve test

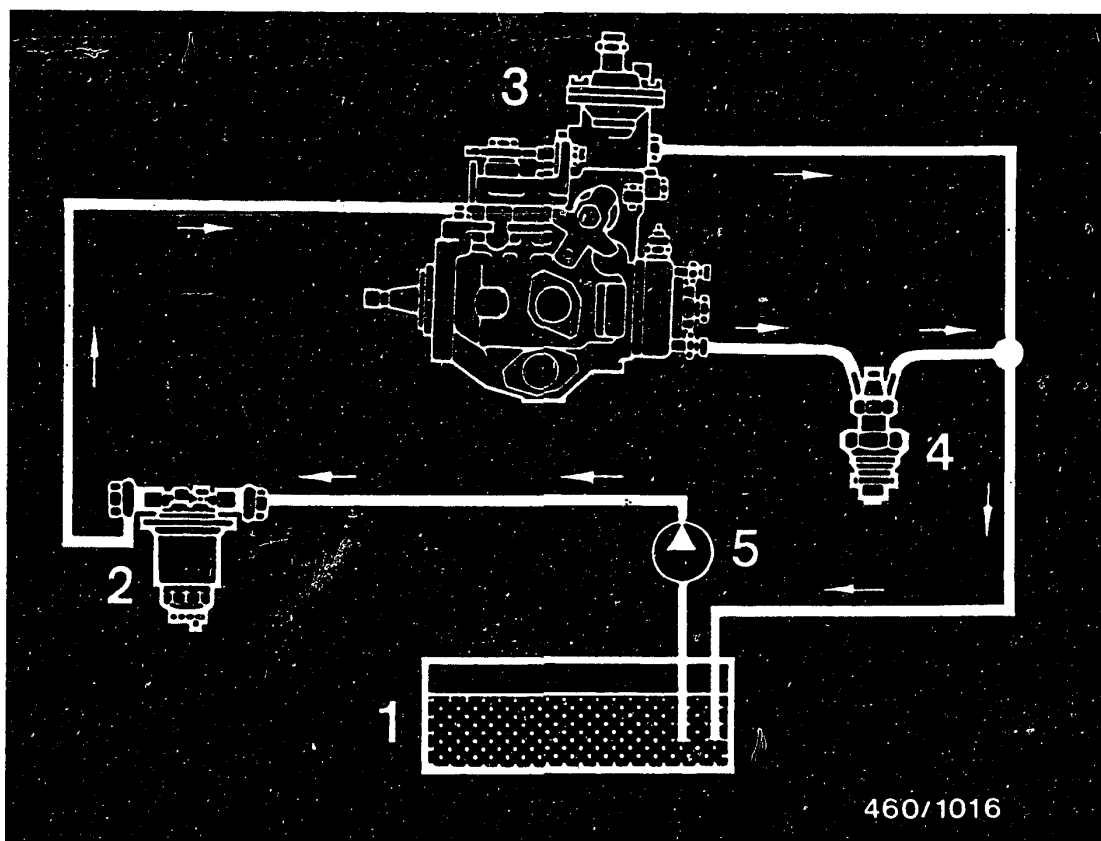
Remove fuel-injection tubing.
Take out solenoid-operated valve.
Cleanliness is essential.

When removed, check operation of solenoid-operated valve.

Note:

When removed, the solenoid-operated valve must only be supplied with voltage for a short period of time since it is no longer being cooled by the fuel.
Check valve seat in hydraulic head (visual inspection).





460/1016

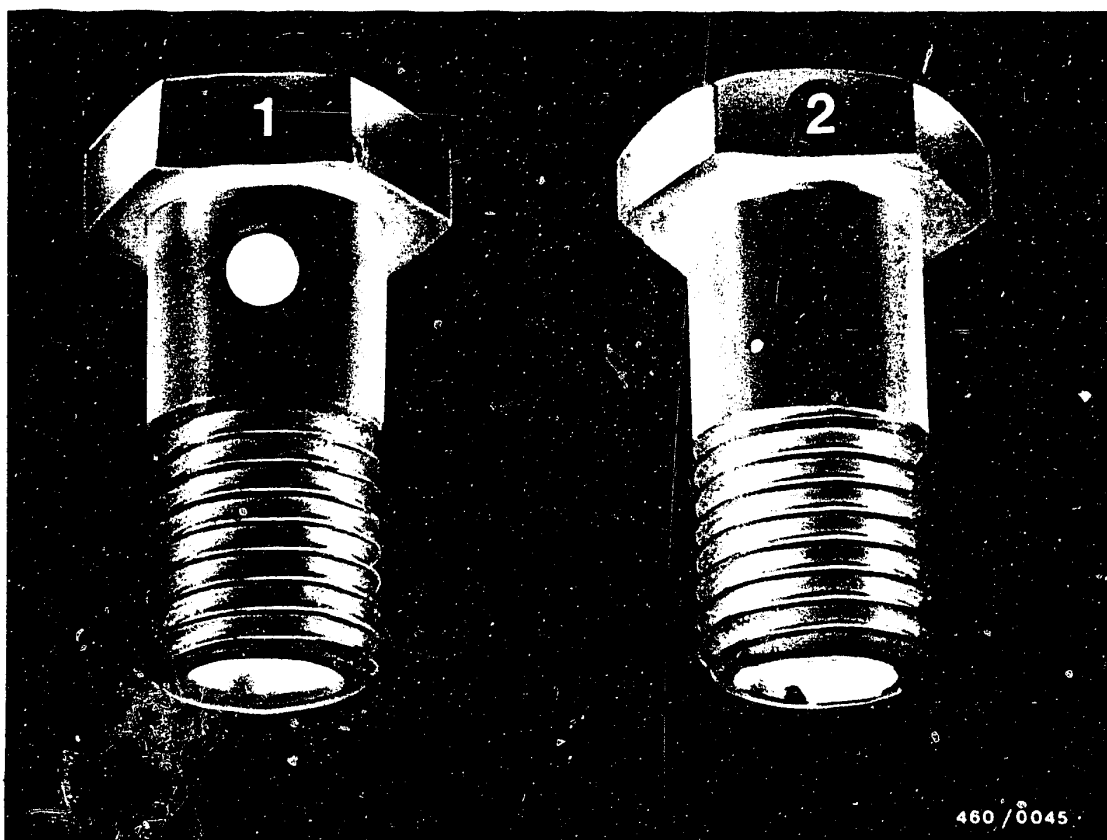
- 1 = Fuel tank
- 2 = Fuel filter.
- 3 = Distributor-type fuel-injection pump
- 4 = Injection nozzles
- 5 = Fuel pre-supply pump

13. Connection diagram of fuel lines

The fuel lines are connected as shown in the above diagram.

The fuel flows in the direction of the arrows.

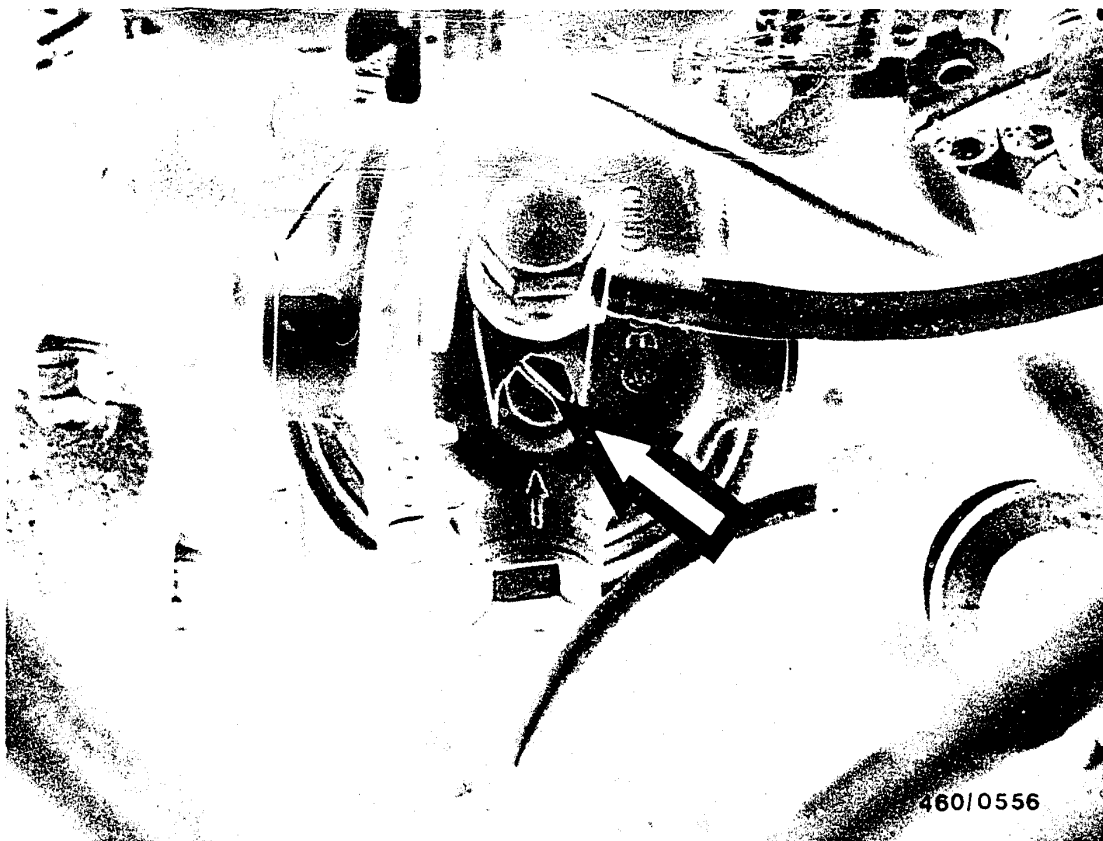




As regards the connections to the fuel-injection pump, ensure that the inlet-union screw for fuel inlet (1) and the throttle screw for fuel return (2) are not mixed up.

The throttle screw is located on the cover of the fuel-injection pump and the head of the screw is marked with the word "out".





14. Bleed fuel system.

Fill fuel filter and injection pump with diesel fuel.

Tighten hose connections on filter cover.

If fitted, close bleeder screw on fuel filter (arrow).



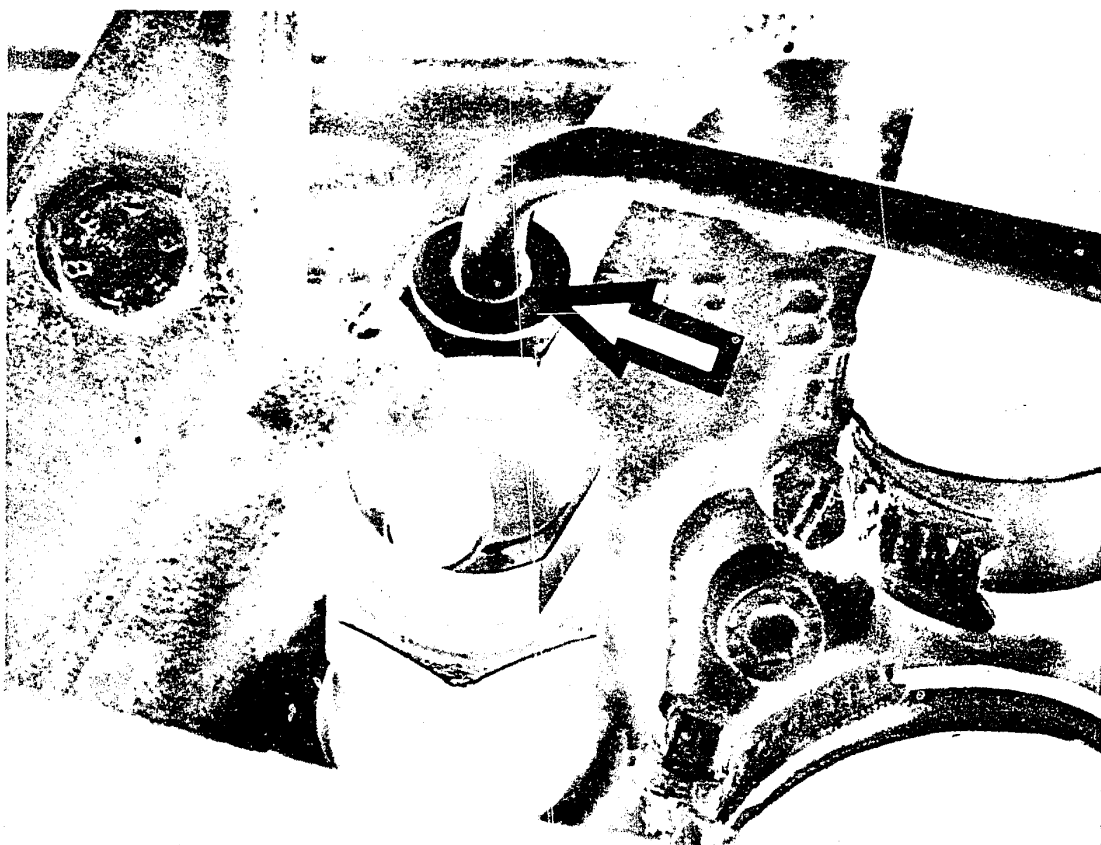


Loosen bleeder screw on injection pump and unscrew by a few turns (arrow).

Loosen union nuts of fuel-injection tubing on nozzle holders.

Operate starting motor without preheating.
When the fuel escaping from the bleed hole on the injection pump is free of bubbles, retighten the bleeder screw.

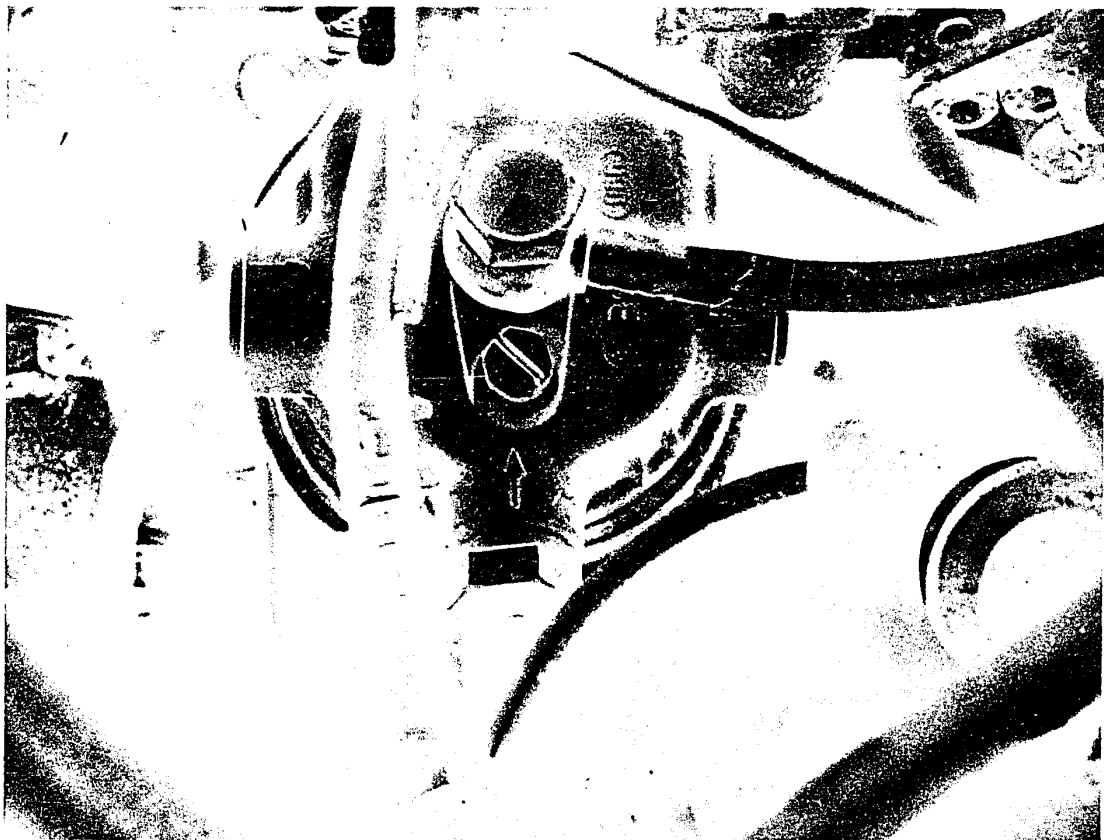




Continue to operate starting motor until fuel escapes from union nuts of nozzle holders (arrow).

Tighten union nuts and operate starting motor until engine starts.





15. Replace and drain water from filter box

15.1 Replace filter box

Unscrew fuel filter out of filter cover.

If stuck, loosen filter box using special wrench, e.g. Matra W 167.

Catch escaping fuel.





Rub diesel fuel into the rubber seal (arrow) of the new filter box.

Screw the filter box into the cover by hand and tighten.

Check the fuel filter for leaks.

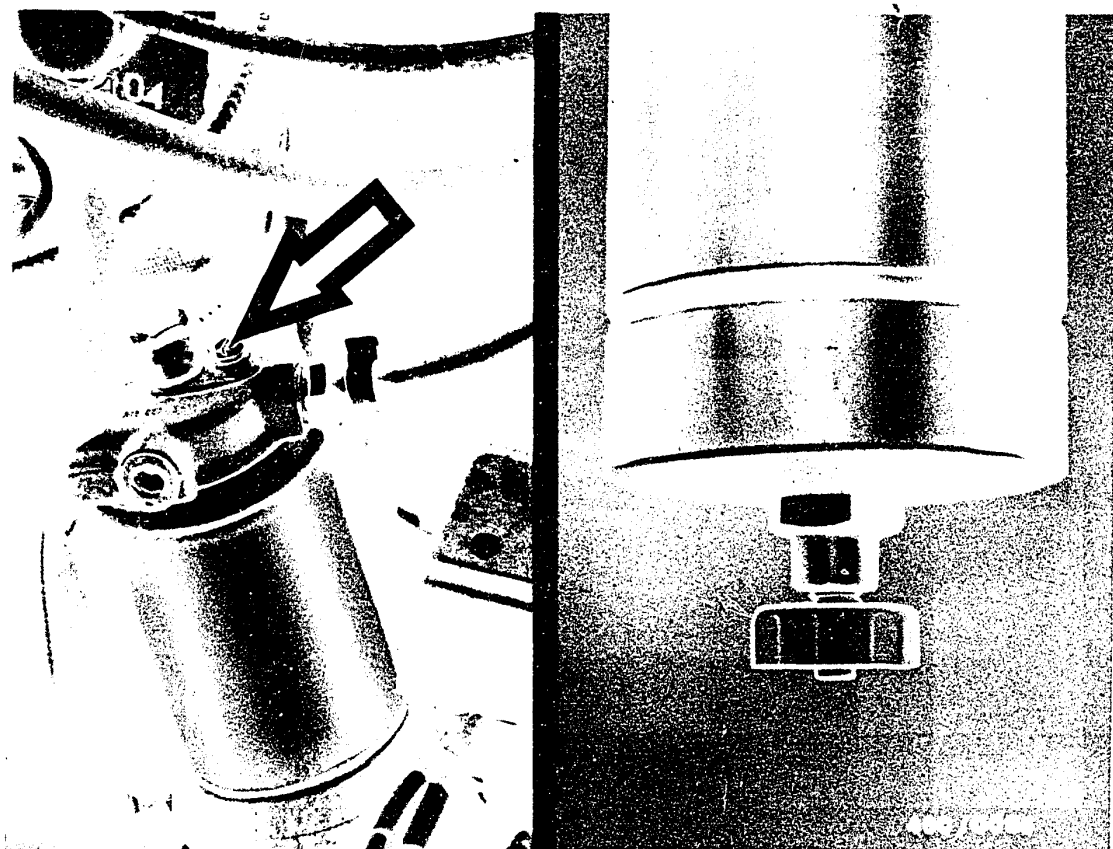
In the case of winter fuel it may be necessary to add petroleum as specified by the vehicle manufacturer.

B23

Replace and drain filter box

Volvo 240D, 740D + 760D-Turbo





15.2 Drain water from fuel filter

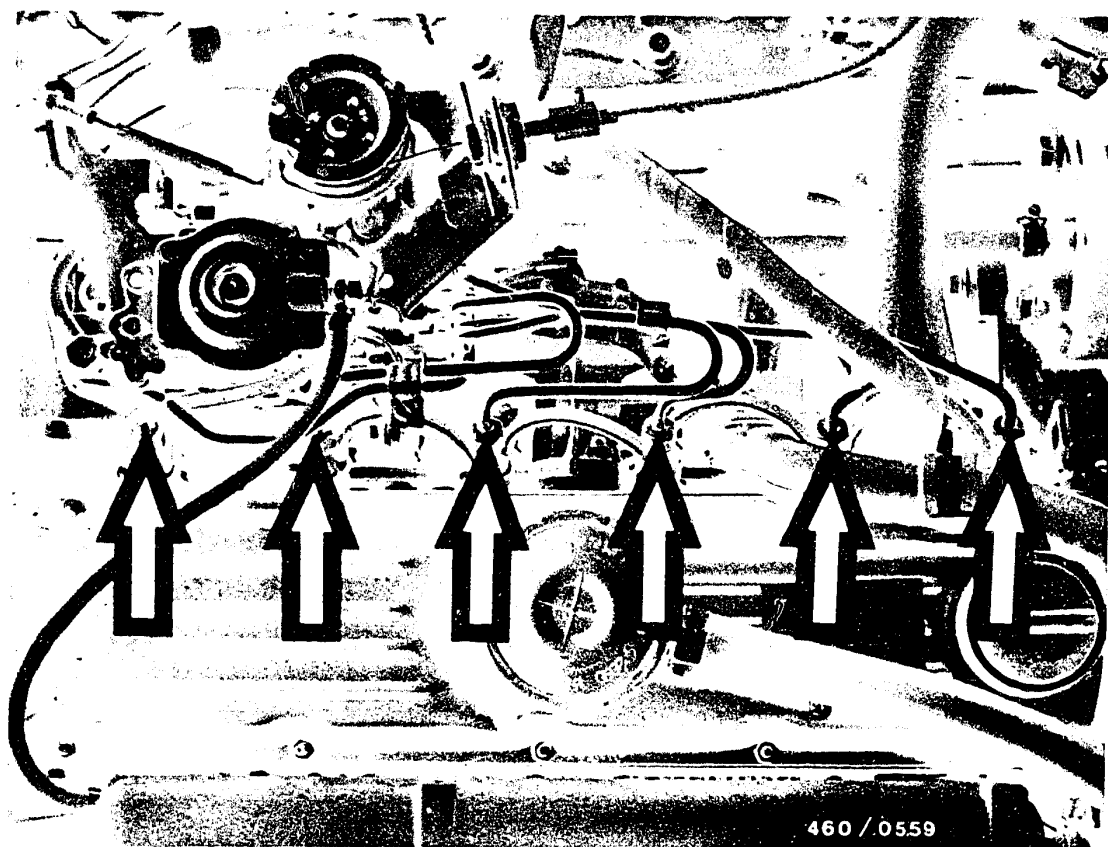
Loosen bleeder screw (arrow) on filter cover by a few turns.

Loosen water-drain screw on base of filter and drain approx. 100 cm³ of liquid into collector vessel.

Tighten water-drain screw and bleeder screw and check for leaks.

If necessary, bleed fuel filter.





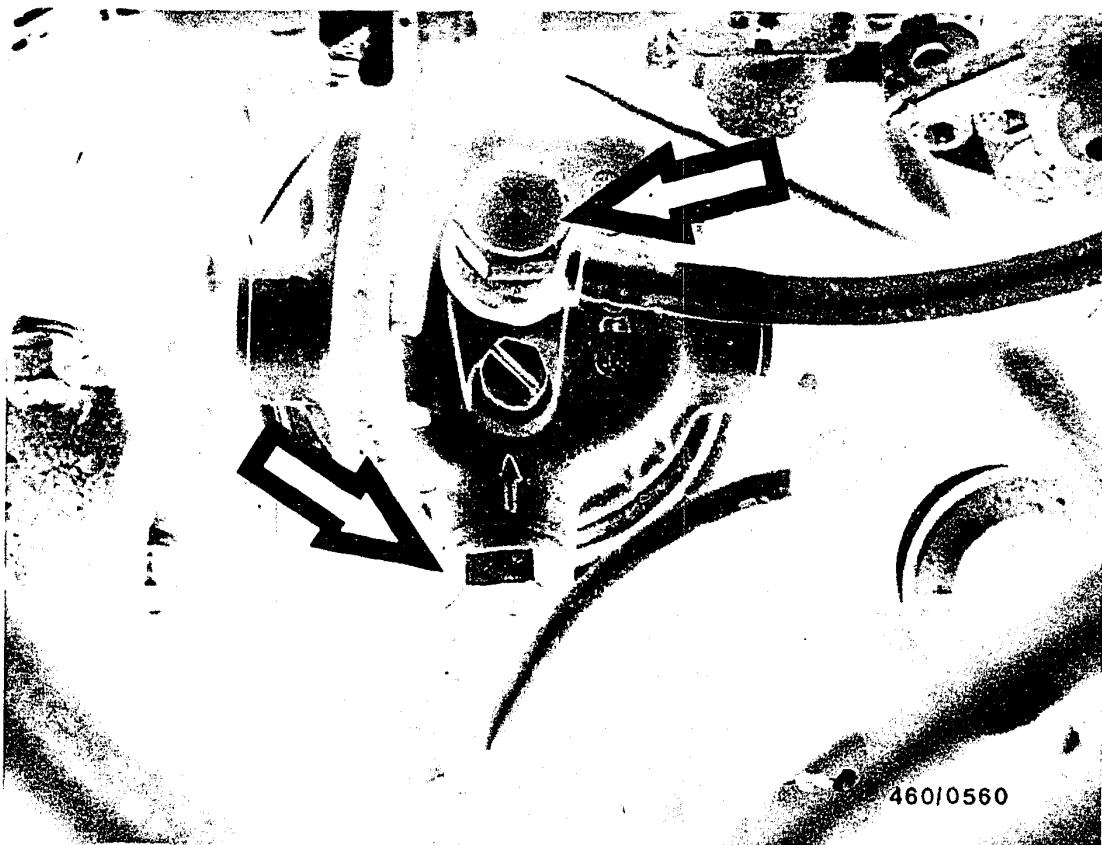
16. Leak test on injection system

Perform leak test with engine at normal operating temperature.

For the leak test, check all connection points of fuel lines. Pay particular attention to:

- Connections at injection-nozzle holders (arrows)



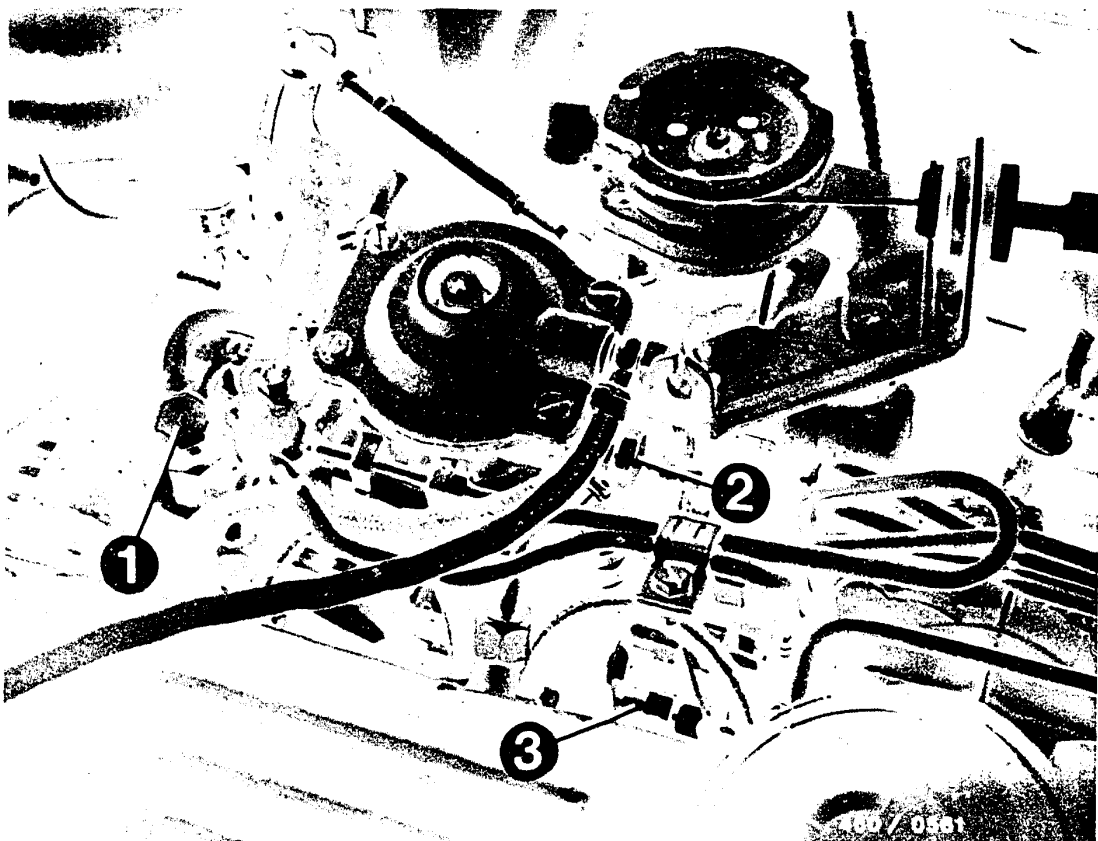


- Connections on fuel filter (arrows).

C2

Test injection system for leaks
Volvo 240D, 740D + 760D-Turbo

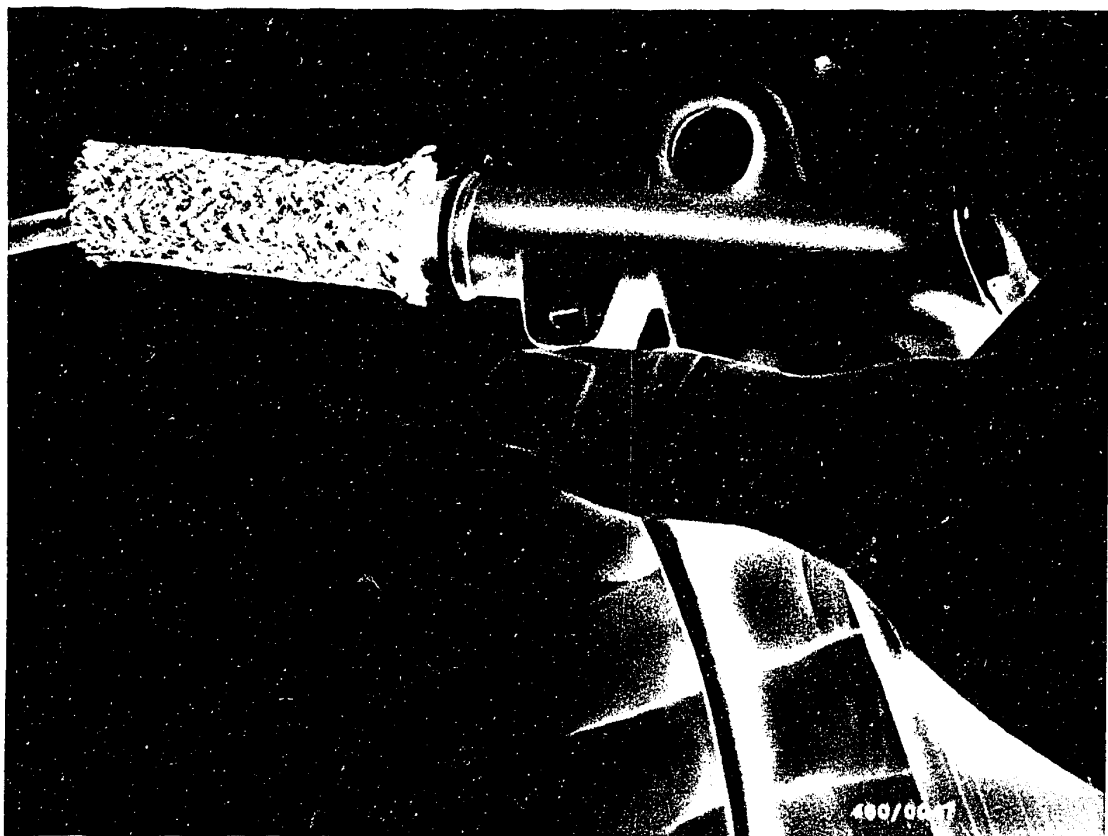




- Inlet line (1) and return line (2) on distributor-type injection pump.
- Delivery-valve holders on hydraulic head (3).

Examine fuel lines for hairline cracks.





17. Check fuel lines

Subject suspect fuel lines to a visual inspection.

If there is no detectable pinching or kinking, the fuel line in question must be removed.

Check fuel line for throughflow using compressed air and clean if necessary.

A suitable hose piece may be used as a side seal, for blowing out the fuel lines.



18. Smoke test - check air filter

18.1 Smoke test

Summary of the contents of the legal regulations (as at April 1978). Applicable to Federal Republic of Germany.

This regulation applies only to the homologation of motor vehicles having at least 4 wheels with a maximum permissible speed of more than 25 km/h. A smoke emission test is not prescribed for official general inspections.

Parts which may have an influence on environmental pollution must be designed in such a way that the legal requirements are met during operation and despite vehicle vibration.

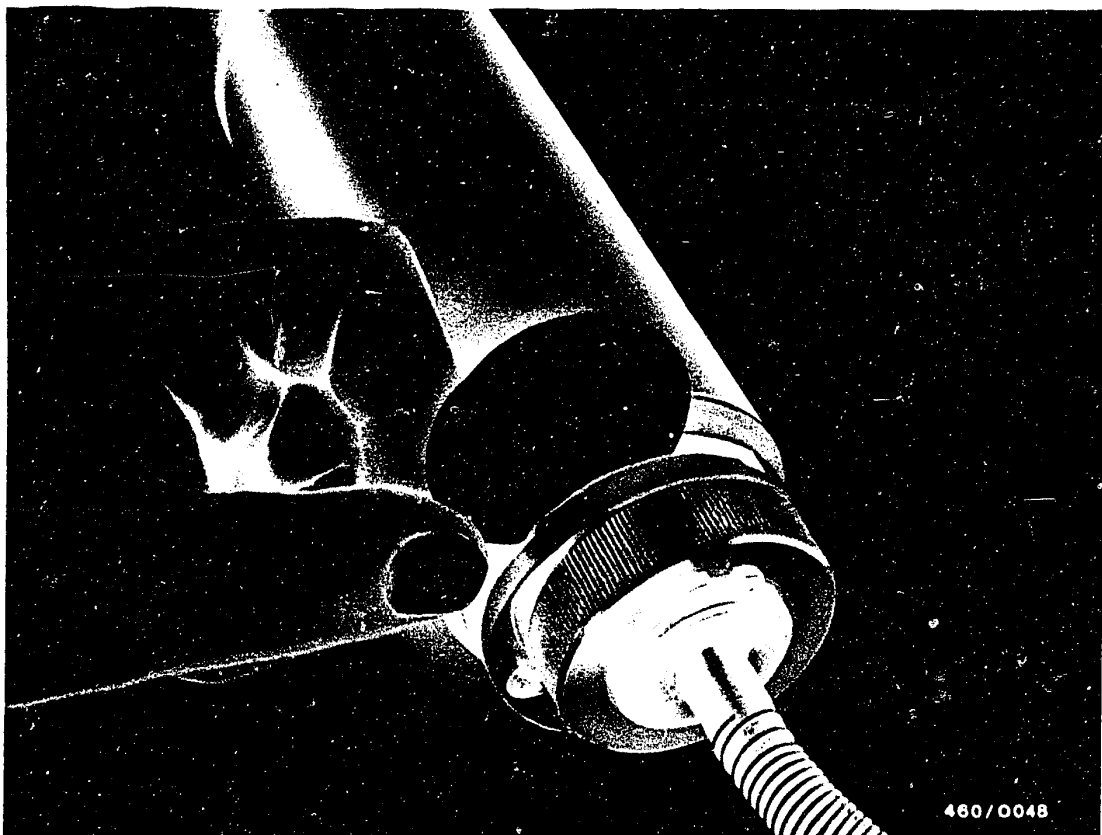
This applies in particular to cold-start devices and full-load stops. The Rheinland-Westfälische TÜV (Technical Inspection Bureau of Rhineland-Westfalia) in Essen is the sole approval agency.

C5

Smoke test

Volvo 240D, 740D + 760D-Turbo





18.1.1 Test setup

The smoke test is conducted using the Bosch filter-type smokemeter.

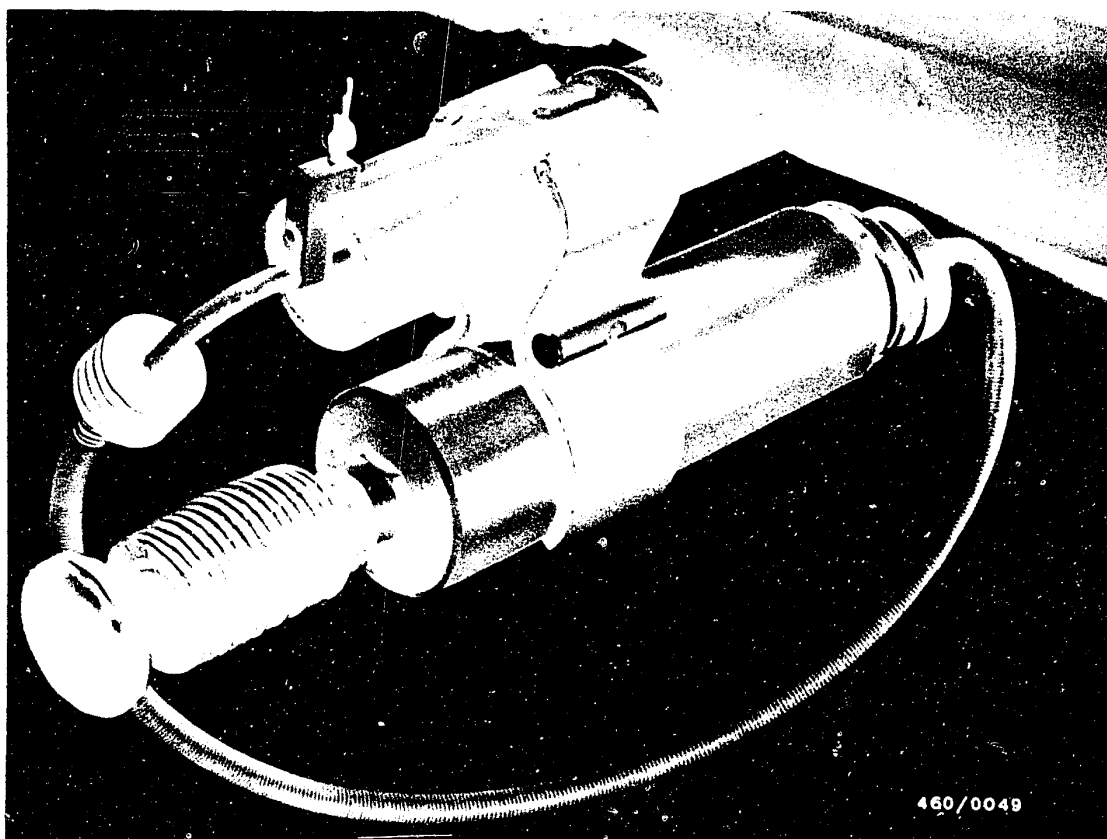
The filter-type smokemeter consists of the following units:

Accessories box with proportioning pump	0 681 169 038
---	---------------

Evaluating unit	0 684 102 050
-----------------	---------------

Insert filter plate into proportioning pump.





Mount sampling pump on exhaust pipe using appropriate clamp.

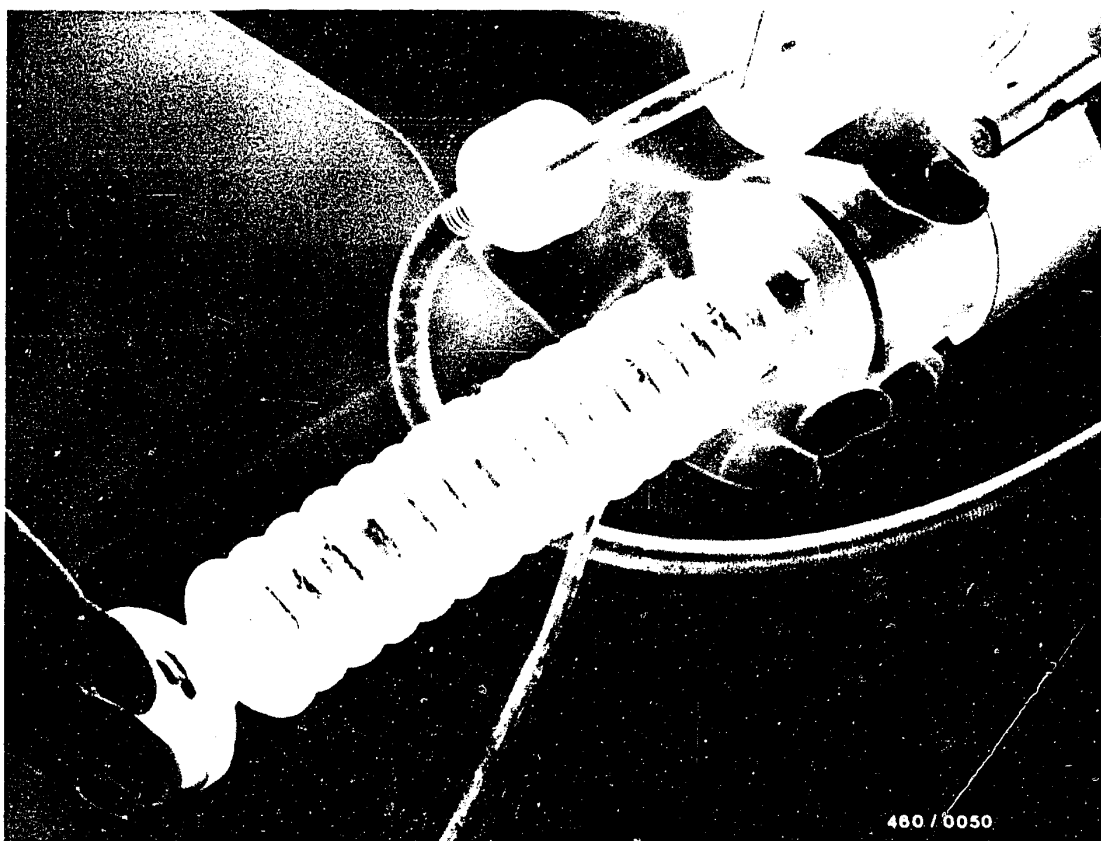
Introduce exhaust-sample pickup as far as possible into exhaust pipe and clamp in position.

C7

Smoke test

Volvo 240D, 740D + 760D-Turbo





18.1.2 Test procedure

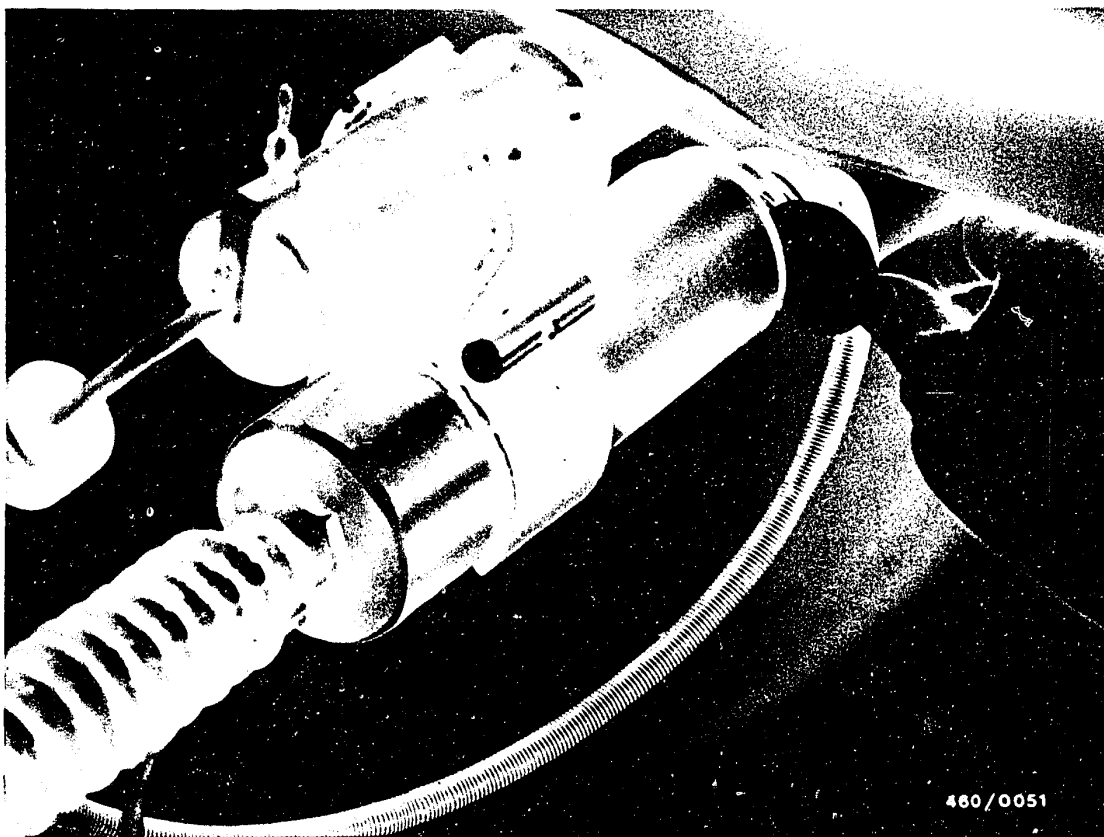
Set proportioning pump by pressing in the black push-button.

Take rubber ball on triggering hose and enter passenger compartment.

The test can be performed on the chassis dynamometer or on the road (gradient).

The chassis dynamometer is preferable in any case. Find the gear in which, with the accelerator pedal in the full-load position, a speed of approx. 40 km/h is reached. Load the engine so that, with the accelerator in the same position, a speed of approx. 25 km/h is reached.





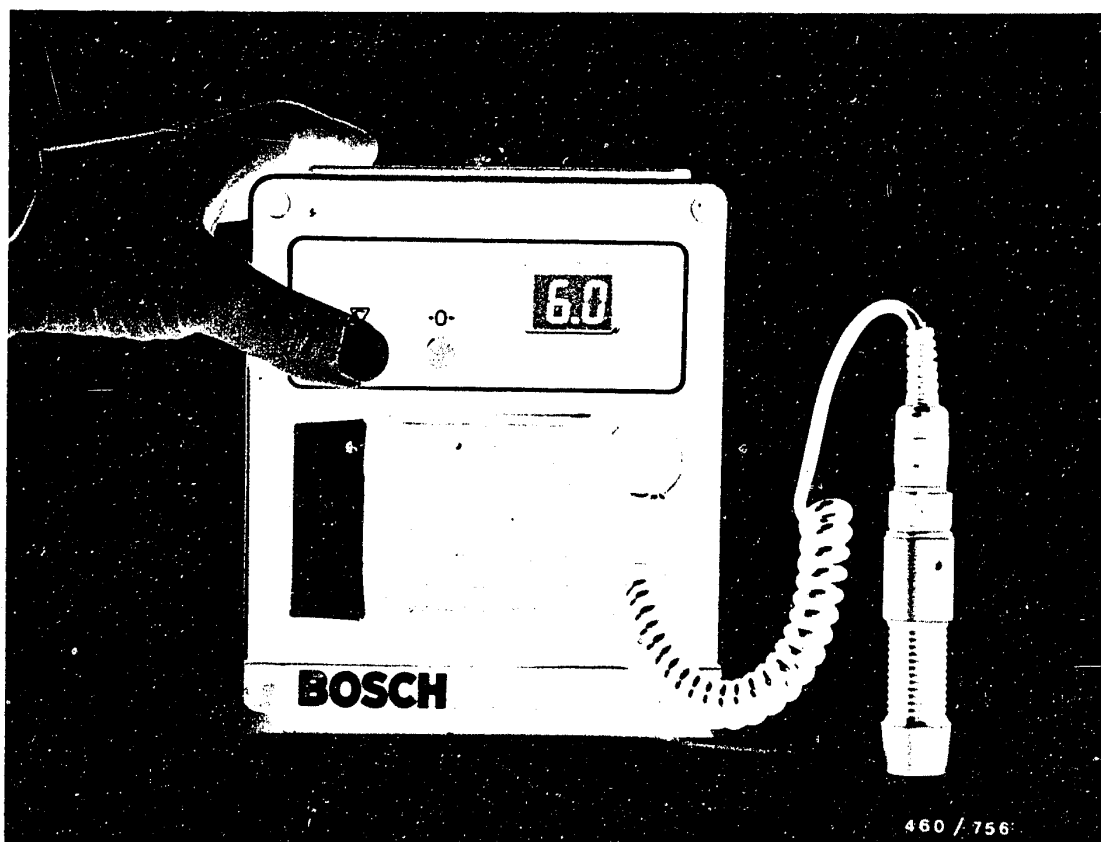
Maintain this load condition for 5 seconds and then trigger the sampling pump by pressing the rubber ball.

Switch off engine.

Caution!

During the following operation, pay attention to the fact that the exhaust pipe has been heated due to the running of the engine.

Remove filter plate from sampling pump.



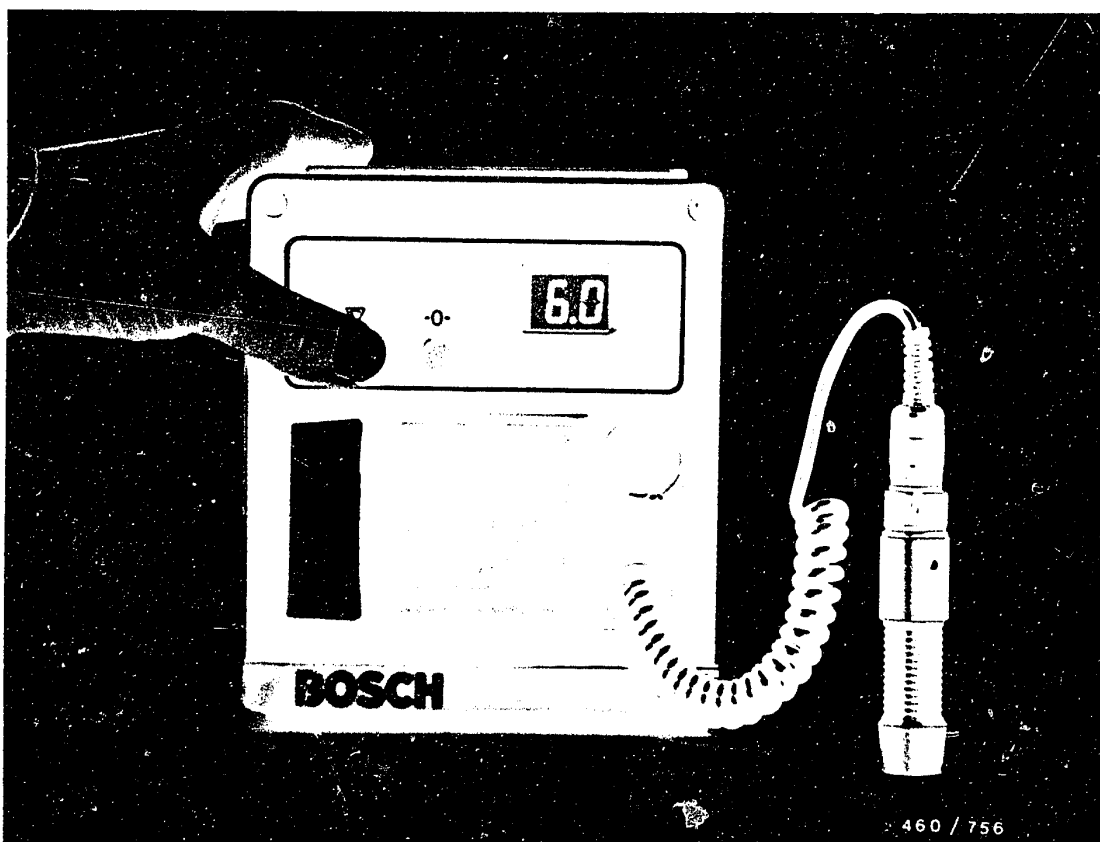
Setting the Zero Point

The zero point adjustment must be performed

- before each measurement series
- if there are changes in ambient conditions
- each time the lens of the photo-element adapter has been cleaned.

Firmly press the measuring head of the photo-element adapter onto 5 clean, white filter plates placed one on top of the other.

Press button "0" until display 0.0 appears.
Release button "0".



Measuring

With the sooted side at the top, lay filter plate from metering unit on 3 new filter plates placed one on top of the other.

Press measuring head vertically on to black surface of filter plate. At the same time, press button "C" until smoke number appears in display.

Note:

Measuring head must be firmly mounted both for the zero point adjustment and for measuring (even slight tilting may lead to incorrect measurements).

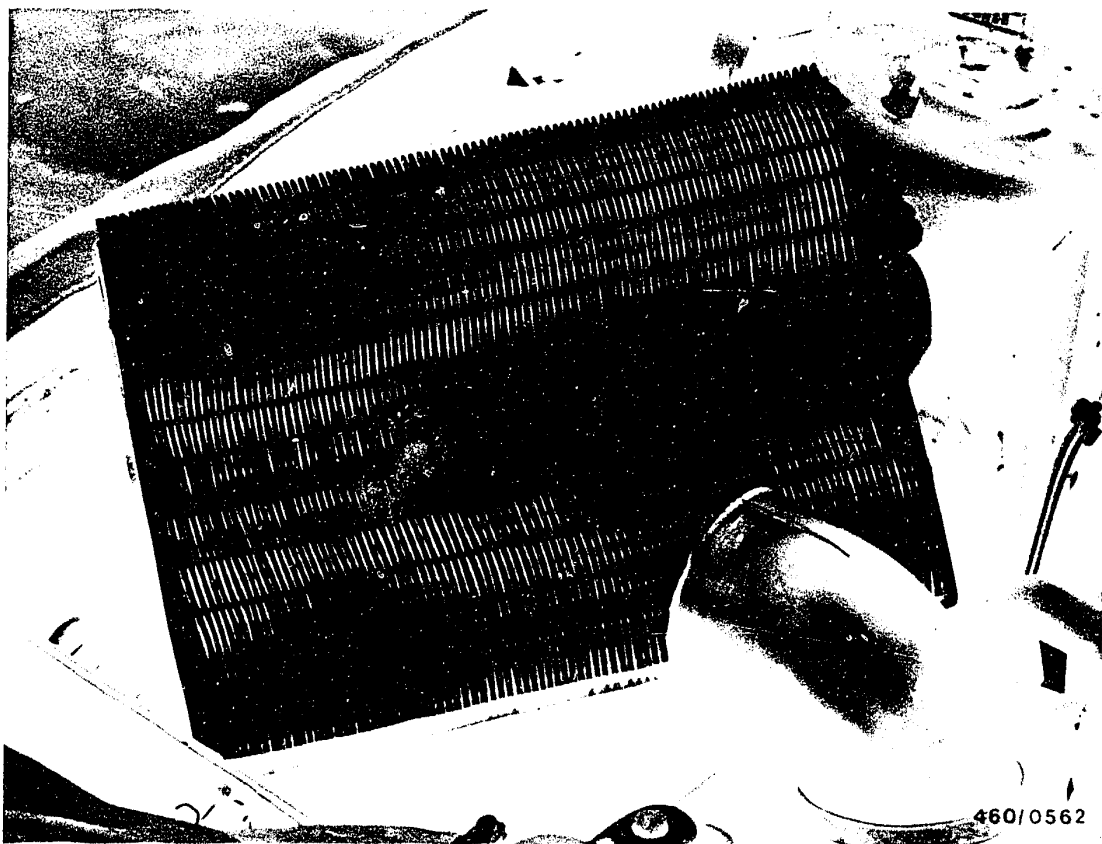
Compare the smoke number with the evaluation sheet.
Note kW (HP) information of vehicle manufacturer.

C11

Smoke test

Volvo 240D, 740D + 760D-Turbo





18.2 Check air filter

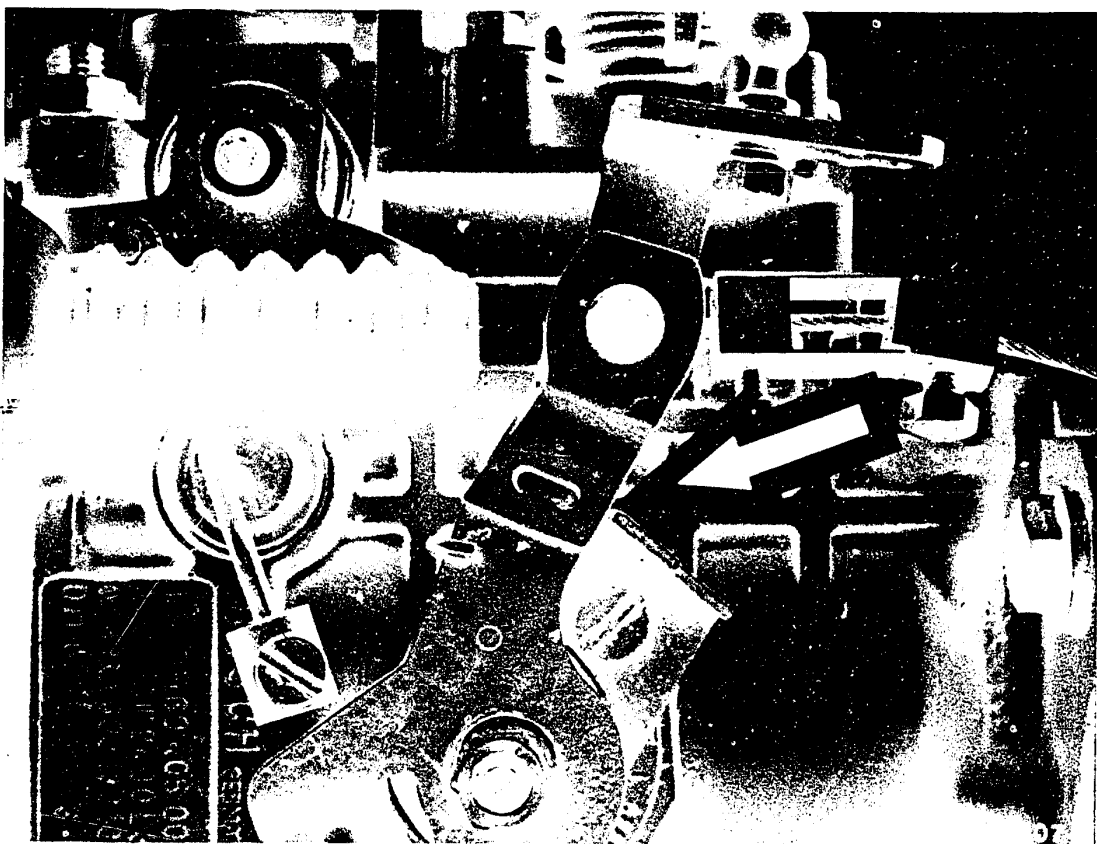
Remove air filter and subject to a visual inspection.

Test criteria for air filter:

- If air filter dusty - knock out
- If air filter oil-fouled - replace
- Solid parts in air filter (e.g. leaves) - remove.

If in doubt, use new filter element.





19. Idle speed adjustment

Connect the tachometer (e.g. photoelectrically) to the engine.

Start the engine and run it at idle speed.

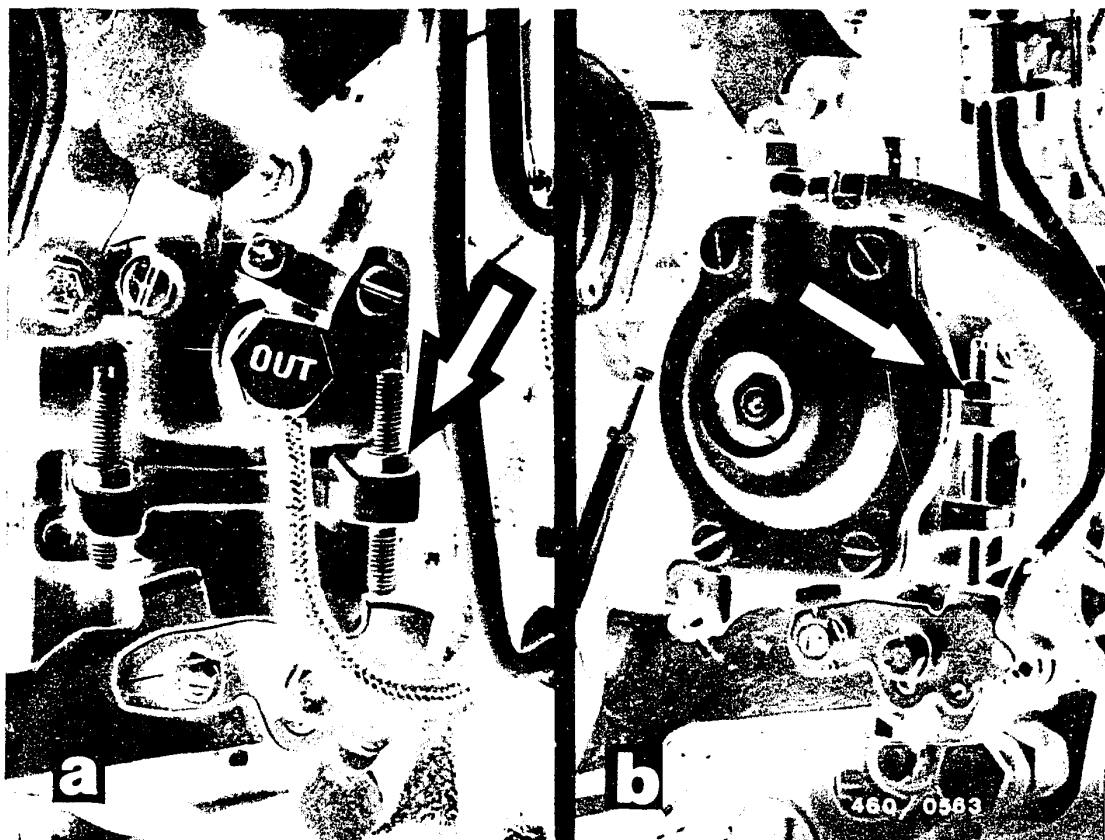
Note:

For adjustment of the idle speed, the engine must be at normal operating temperature.

The control lever of the cold-starting accelerator must be against the stop bracket (arrow).

Cooling water temperature $+80^{\circ}\text{C}$.





Picture a = Naturally aspirated engine (D 20, D 24)

Picture b = Turbocharged engine (D 24 T)

Adjust engine speed at idle-adjusting screw (arrow) to:

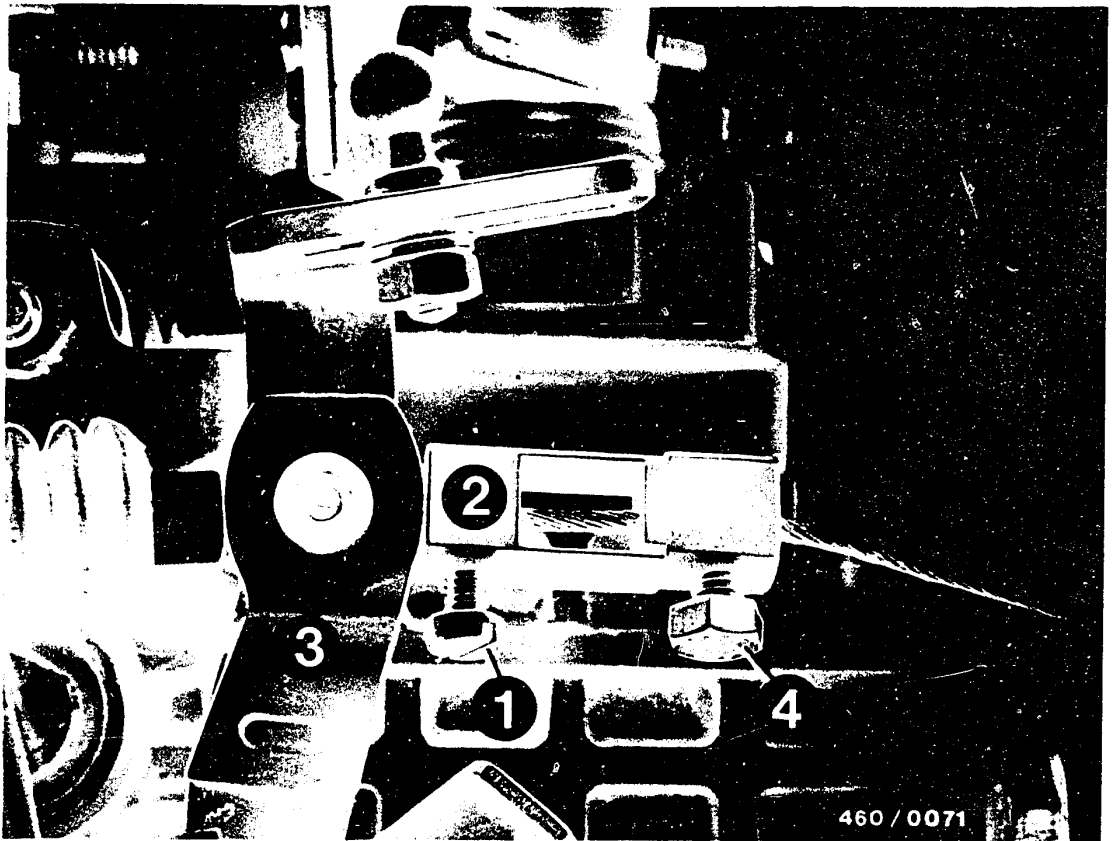
D20, D 24	$750 \pm 50 \text{ min}^{-1}$
D24 T - 1984	$750 \pm 50 \text{ min}^{-1}$
D24 T 1985-	$830 \pm 50 \text{ min}^{-1}$

Adjust engine speed to $750 \pm 50 \text{ min}^{-1}$ at the idle-speed adjusting screw (arrow).

Note that the camshaft and the injection pump are driven at half the engine speed.

After adjusting, lock and seal the adjusting screw.





19.1 Adjust accelerator cable

With the engine cold, before adjusting the accelerator cable, the cold-start accelerator (KSB) must be in the zero position.

To do this, loosen clamping screw (1) on injection pump.

Pull intermediate piece (2) with control lever (3) in direction of hydraulic head.

Turn intermediate piece (2) through 90° and slide again in direction of drive shaft until control lever (3) is up against stop bracket.

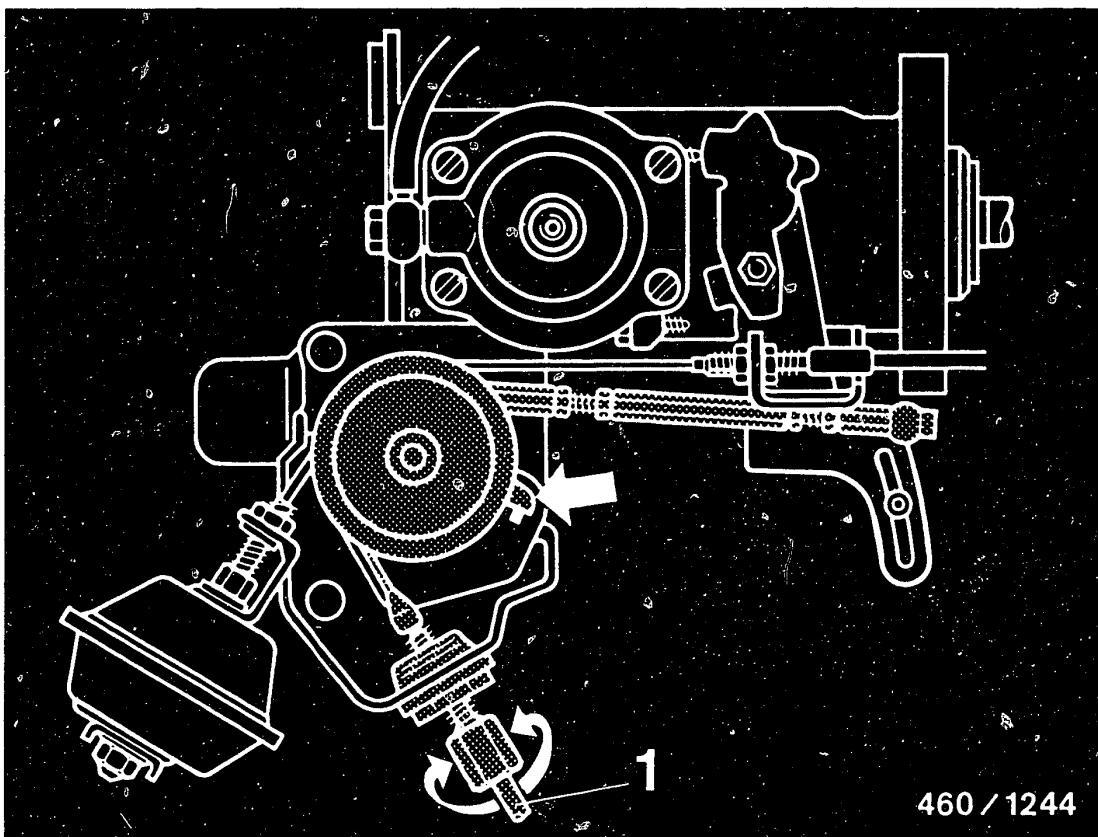
In this position, the control device is off.

Note:

Screw (4) must not be loosened.

Otherwise, it will be necessary to reset the control device.





460 / 1244

Adjust cable sleeve (1) so that the cable is taut, but the deflector roller does not lift off the stop (arrow).

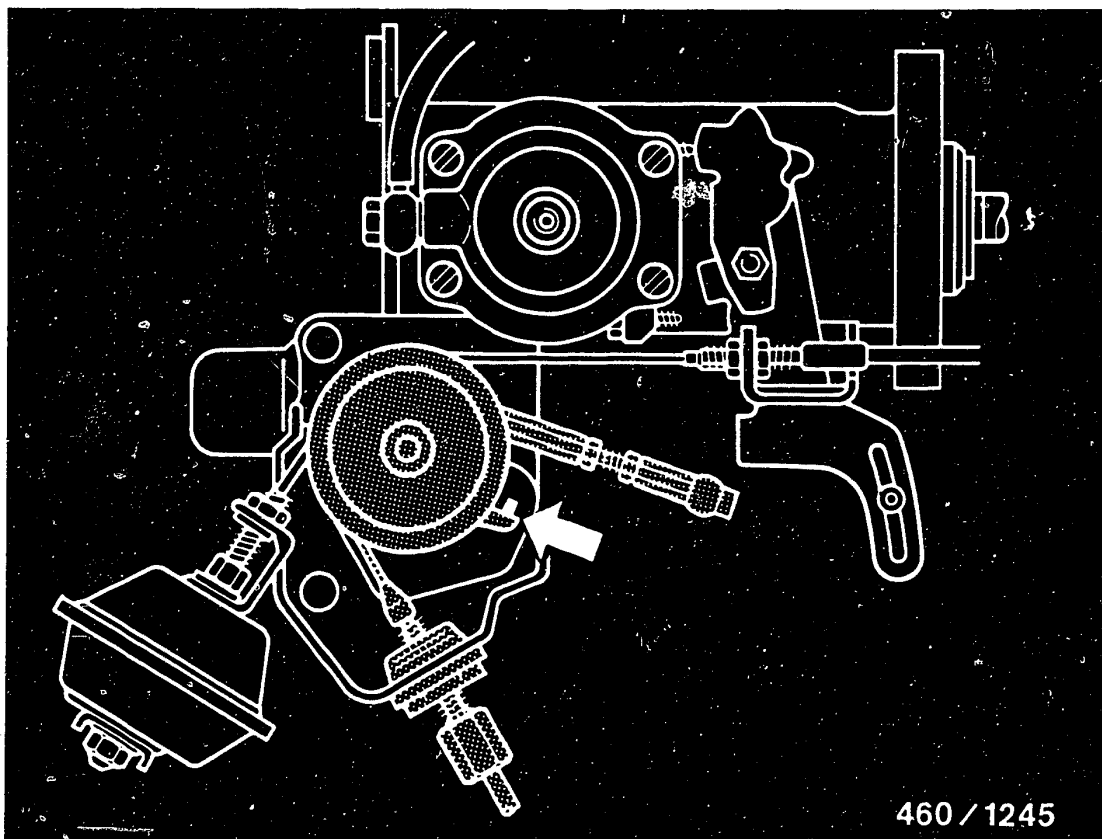
Note:

The connection to the injection-pump control lever is unhooked while doing this.

C16

Adjust idle speed
Volvo 240D, 740D + 760D-Turbo





460 / 1245

Test full-throttle adjustment

Fully depress accelerator.

The deflector roller must come up against the limit stop (arrow).

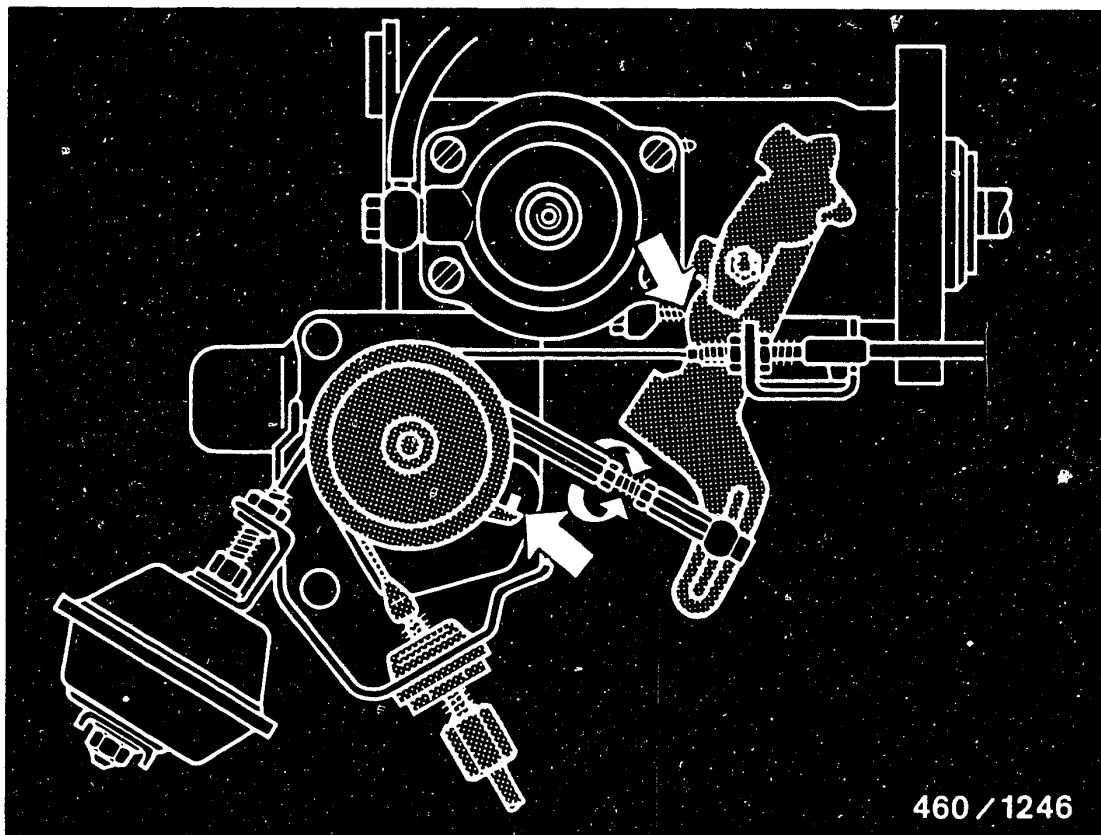
If necessary, correct cable adjustment.

C17

Adjust idle speed

Volvo 240D, 740D + 760D-Turbo





Ajust full-throttle adjustment at throttle linkage

Hook connection piece into injection-pump control lever.

Bring deflector roller up against limit stop.

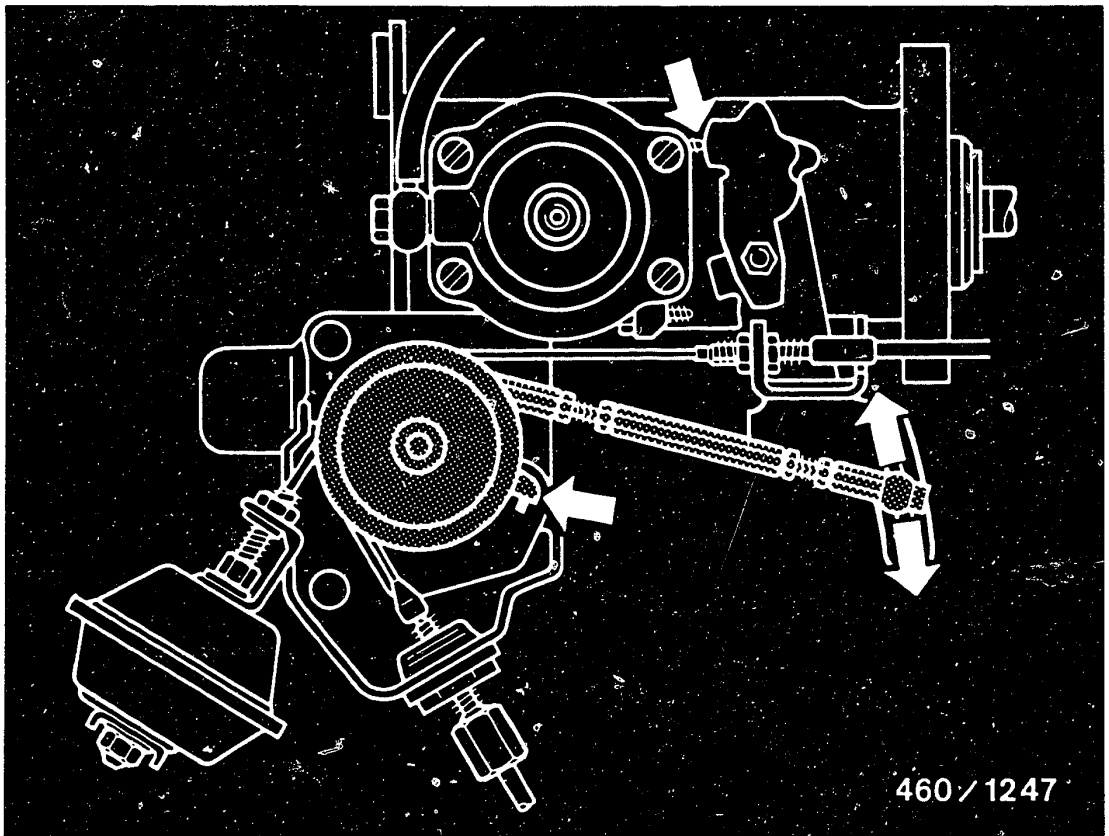
Adjust connecting linkage to injection-pump control lever so that the control lever is up against the maximum-speed stop.

C18

Adjust idle speed

Volvo 240D, 740D + 760D-Turbo





Adjust low idle speed

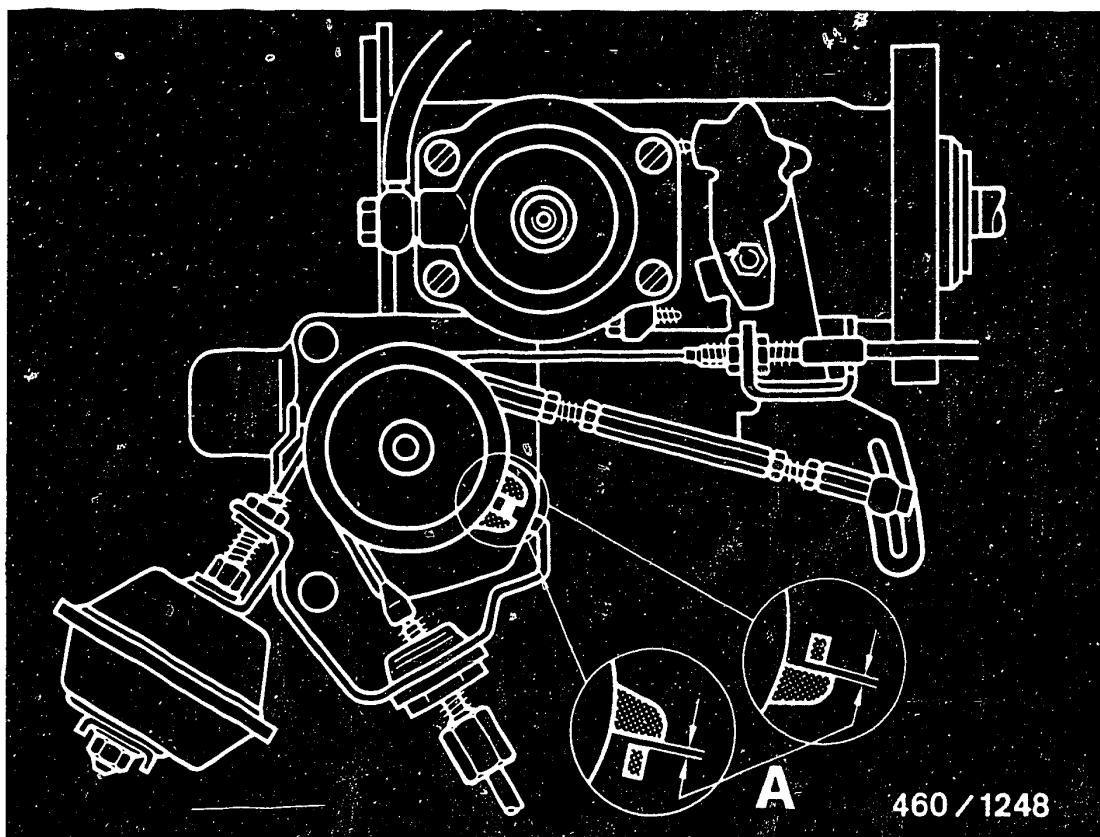
Bring deflector roller up against idle stop.

Injection-pump control lever must be up against the idle-stop screw of the injection pump.

Correct by changing the position of the ball joint.

After this correction, the setting of the maximum-speed stop must be checked (two-way correction).





A = max. 0.3 mm

Fine adjustment at throttle leakage

After the fine adjustment, check the play between the deflector roller and the stop on both sides.

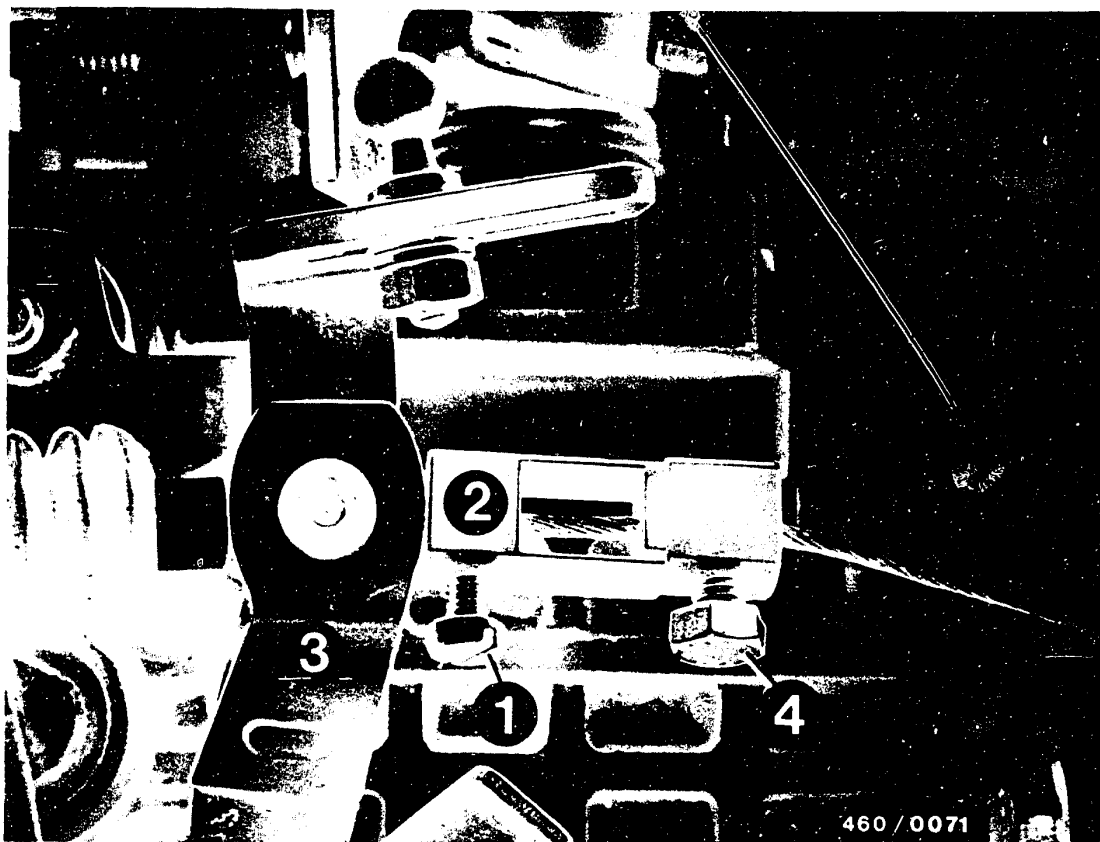
The play must be no more than 0.3 mm.

C20

Adjust idle speed

Volvo 240D, 740D + 760D-Turbo





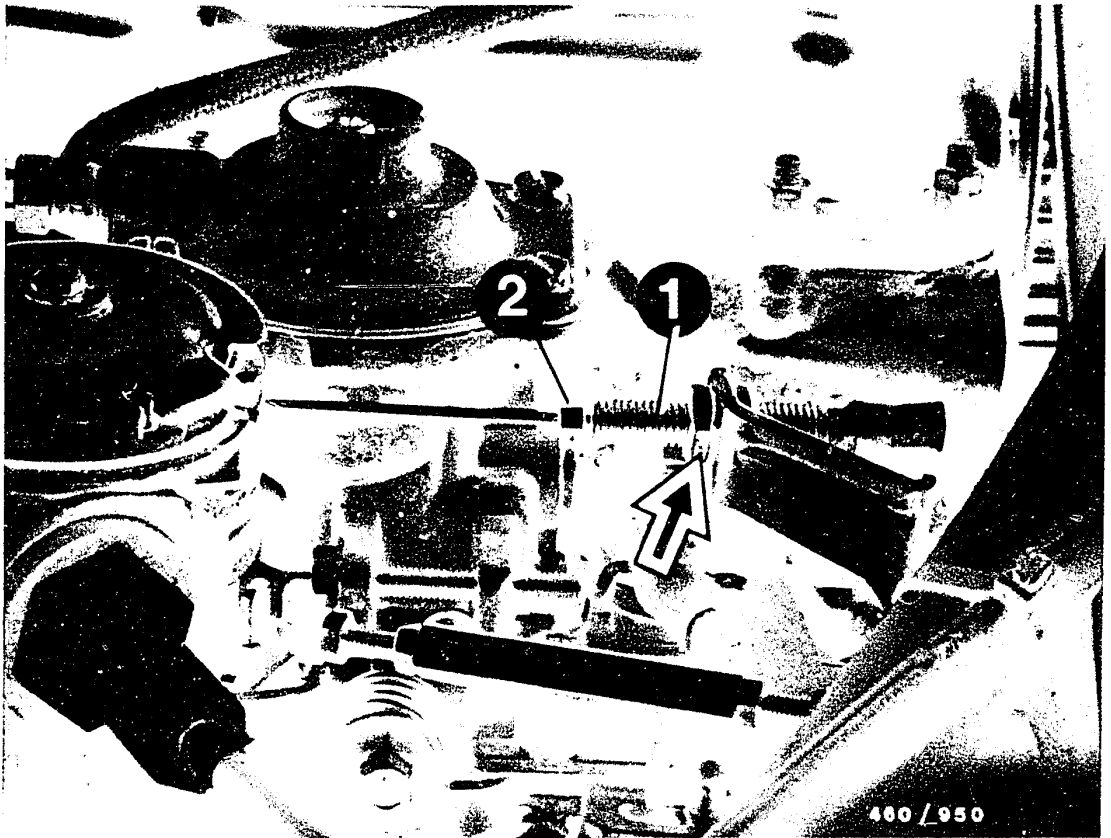
Pull control lever (3) with intermediate piece (2) toward hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft.

The intermediate piece is in the starting position.

Tighten clamping screw (1).





20. Kick Down adjustment

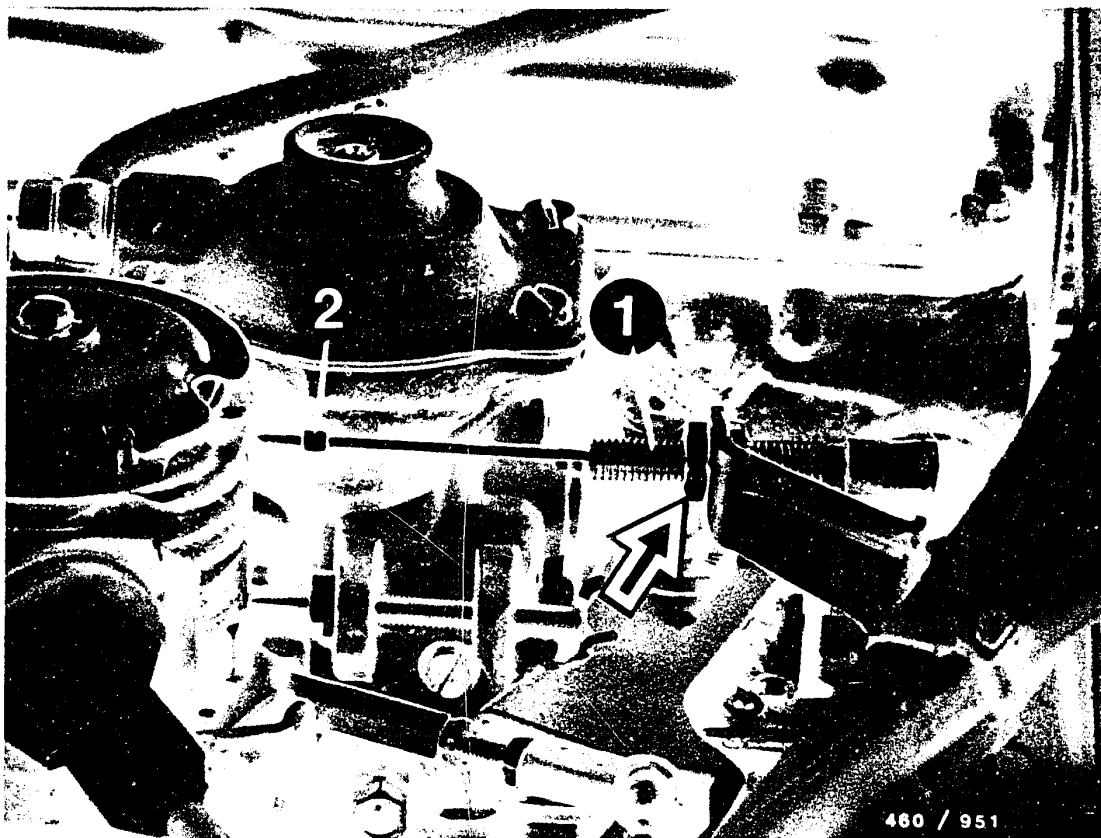
Requirement:

- Engine at normal operating temperature, cooling water temperature $+80^{\circ}\text{C}$.

Adjustment made at idle.

- Release the lock nut (arrow) and set the guide sleeve (1) at a distance from 0.25 ... 1.0 mm to the cable clamp (2).
- Tighten the lock nut and check the setting.





460 / 951

Adjusting the kick down point

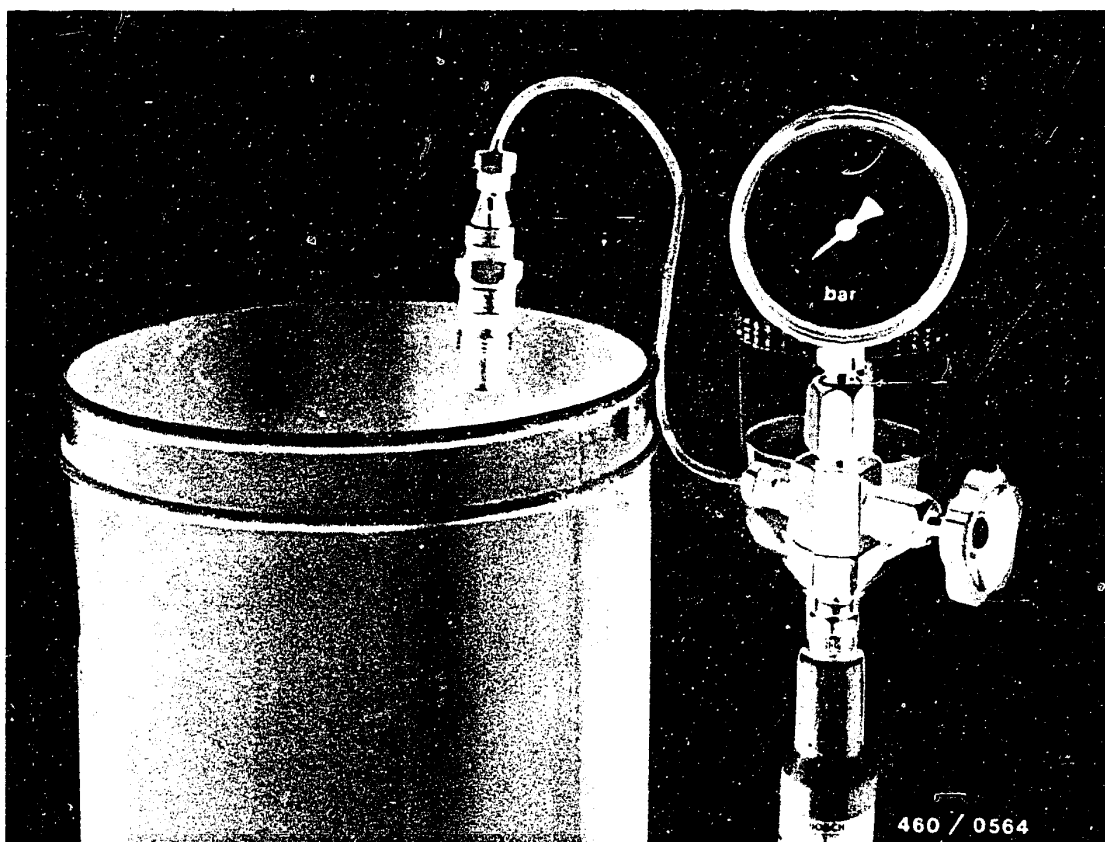
- Push the accelerator pedal down to the Kick Down point.
- Release the lock nut (arrow) and set the guide sleeve (1) to a distance of

+ 1.6
51 - 0.6 mm

to the cable clamp (2).

- Tighten the lock nut, check the setting.





21. Test injection nozzles

Remove injection nozzles.

The test is performed using the nozzle tester EFEP 60 H 0 681 200 502.

Mount injection nozzle with nozzle-holder assembly on nozzle tester.

When testing injection nozzles, make sure that the fuel spray does not strike your hands since, due to the high pressure, the fuel will penetrate into the skin and may cause blood poisoning.



Instructions:

When checking fuel-injection nozzles, make certain that the fuel jet does not strike your hands, because, due to the high pressure, the fuel penetrates into the skin and can cause blood poisoning.

For testing, use pure calibrating oil per ISO 4113 or clean diesel fuel.

Test criteria:

- Opening pressure
- Leaks
- Chatter
- Spray pattern

21.1 Checking opening pressure

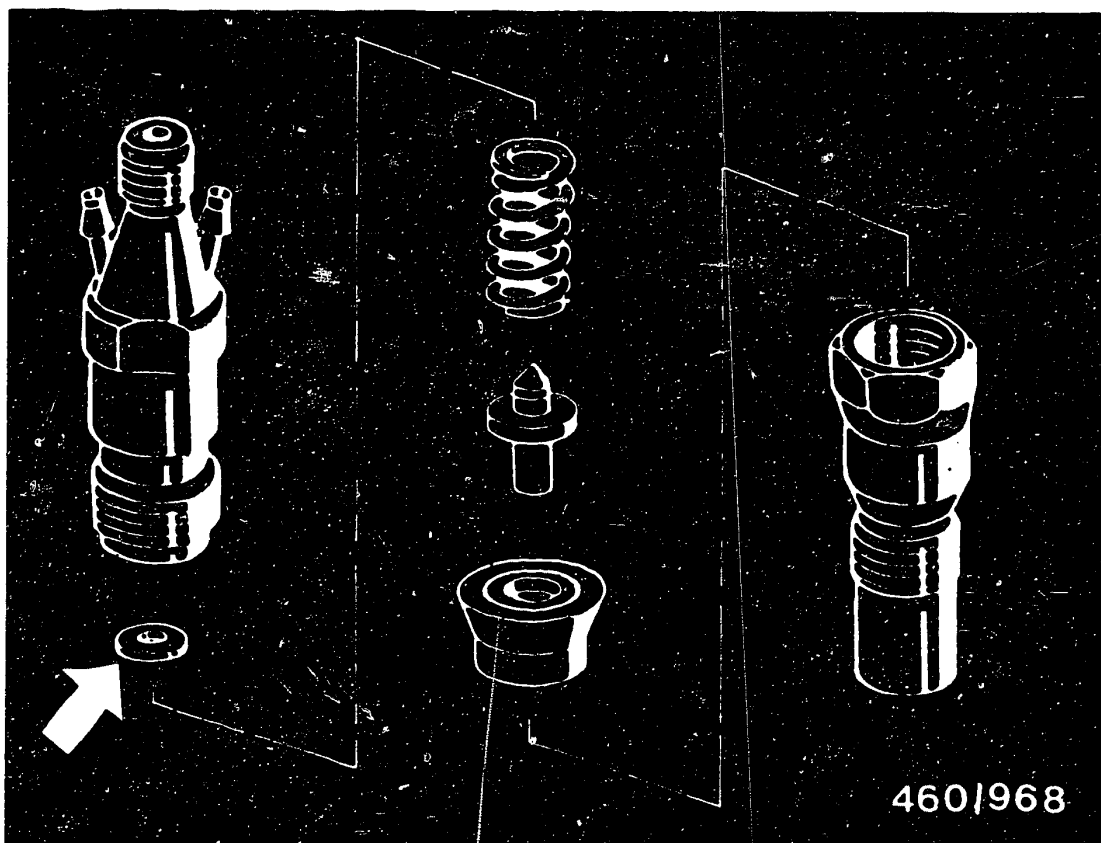
Open the spray valve on the pressure gauge by approx. 1/4 turn.

Slowly press down the manual lever on the nozzle tester (increased pressure on the pressure gauge).

Watch at which pressure the pointer of the pressure gauge stays (nozzle not chattering) or at which the pressure suddenly drops (nozzle chattering).

The maximum pressure attained in so doing is the opening pressure.





If there is a deviation from the specified value, correct the nozzle opening pressure by means of compensating washers behind the pressure spring (arrow).

D20, D24	D24T
Checking value: 120...140 bar	145...163 bar
Setting value: 130...138 bar	155...163 bar

thicker washers = higher nozzle opening pressure

thinner washers = lower nozzle opening pressure

Changing the spring travel by ± 0.05 mm changes the nozzle opening pressure by approx. 5.0 bar.



21.2 Checking for leaks

Open the shutoff valve on the pressure gauge by approx. 1/4 turn.

Dry off the lower portion of the nozzle and nozzle-holder assembly. (Blow it dry with air.)

Slowly press down on the hand lever until the pressure gauge indicates 20 bar less than the opening pressure as read above. The nozzle does not leak if there is no drop dripping from the nozzle opening within 10 seconds.

If a drop drips off, take the nozzle-holder assembly combination apart and clean it.

If the leak is still there, take out and replace the nozzle.

It is not permissible to remachine the parts of the nozzle.

Note:

Striation on the holder assembly and the intermediate disc can be machined off provided the necessary care is taken (other than during the warranty period).



21.3 Chatter test - Evaluation of the spray pattern

General information:

When evaluating nozzles, make a distinction between new and used nozzles.

Switch the pressure gauge off.

New nozzles:

The chatter test makes it possible to test for ease of movement for the nozzle needle in the nozzle body by means of listening. If the nozzle does not chatter in spite of cleaning, it is to be replaced with a new nozzle. In the chatter test, the shape of the spray is of no significance. A spray pattern corresponding to specifications is generally present only with new nozzles.

Used nozzles:

The chatter behavior of the nozzle deteriorates due to wear in the area of the seat. When the lever is moved quickly, the nozzle must chatter audibly and/or spray a well-atomized spray.

In the case of used nozzles, the spray pattern can deviate from the ideal shape from a new nozzle. The spray pattern from such nozzles however can be perceptibly improved by appropriate cleaning.



21.4 Chatter and spray test (nozzle-type related)

This concerns pintle nozzles with throttling action which are installed in all engine types.

These nozzles have a special base form and an additional spray hole through which the prespray escapes.

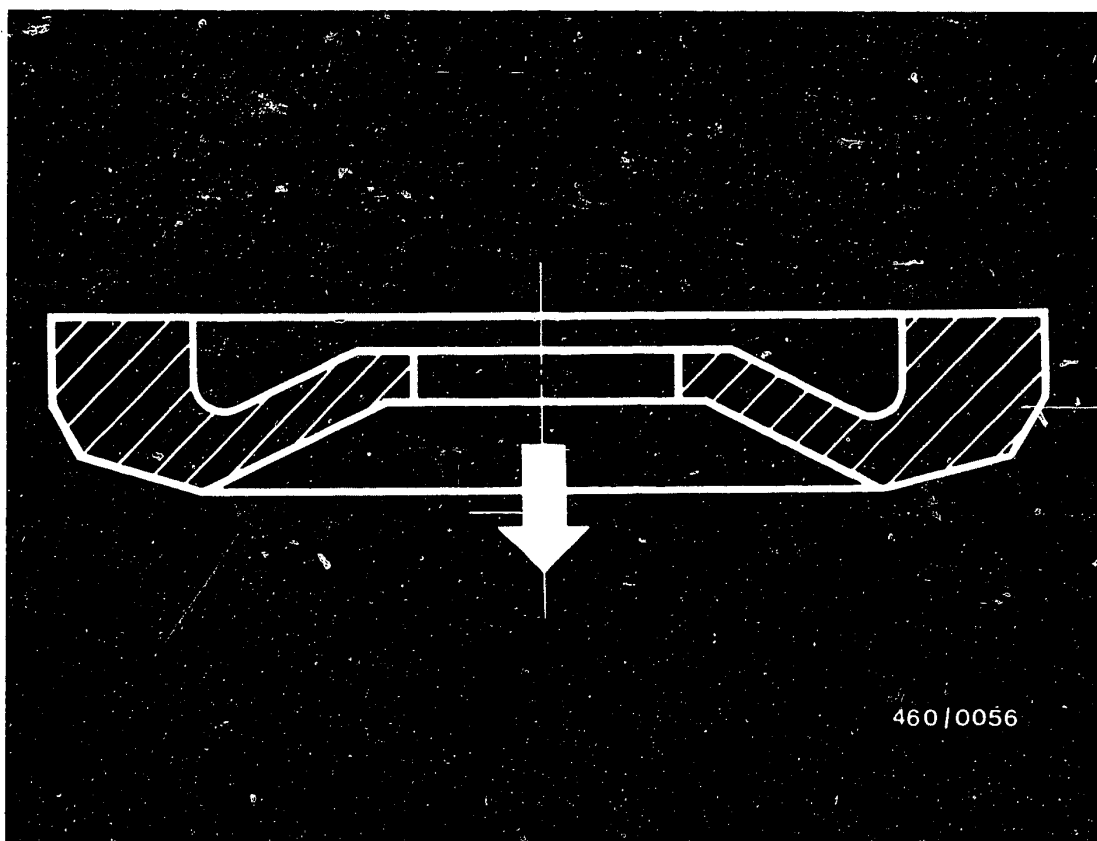
Chatter test:

Due to its special structural features this nozzle chatters very softly. A chatter test is possible with this nozzle only between 1...2 downward movements of the hand lever per second. As the test speed is raised the chattering stops. The calibrating oil then escapes with a hissing noise from the nozzle. The nozzle chatters with a high whistling tone only with rapid movement of the hand lever (about 4...6 downward movements per second).

Spray pattern: (applies only to new nozzles)

At low test speed the major portion of the delivered fuel must escape through the lateral prespray hole, well atomized. An evaluation of the main spray is only possible when the hand lever is moved rapidly (approx 4...6 downward movements per second). The spray must be concentrated and well atomized.





460/0056

21.5 Putting in the fuel-injection nozzles

Before installation of the fuel-injection nozzles, put in a new heat insulator disc in the cylinder head as a shield and lateral compensation for tolerances (sealing cone 150° in the direction of the arrow).

Then screw the nozzle holder into the cylinder head and tighten it to 70 Nm.

Note:

If the tightening torque is exceeded, the nozzle needle can jam.

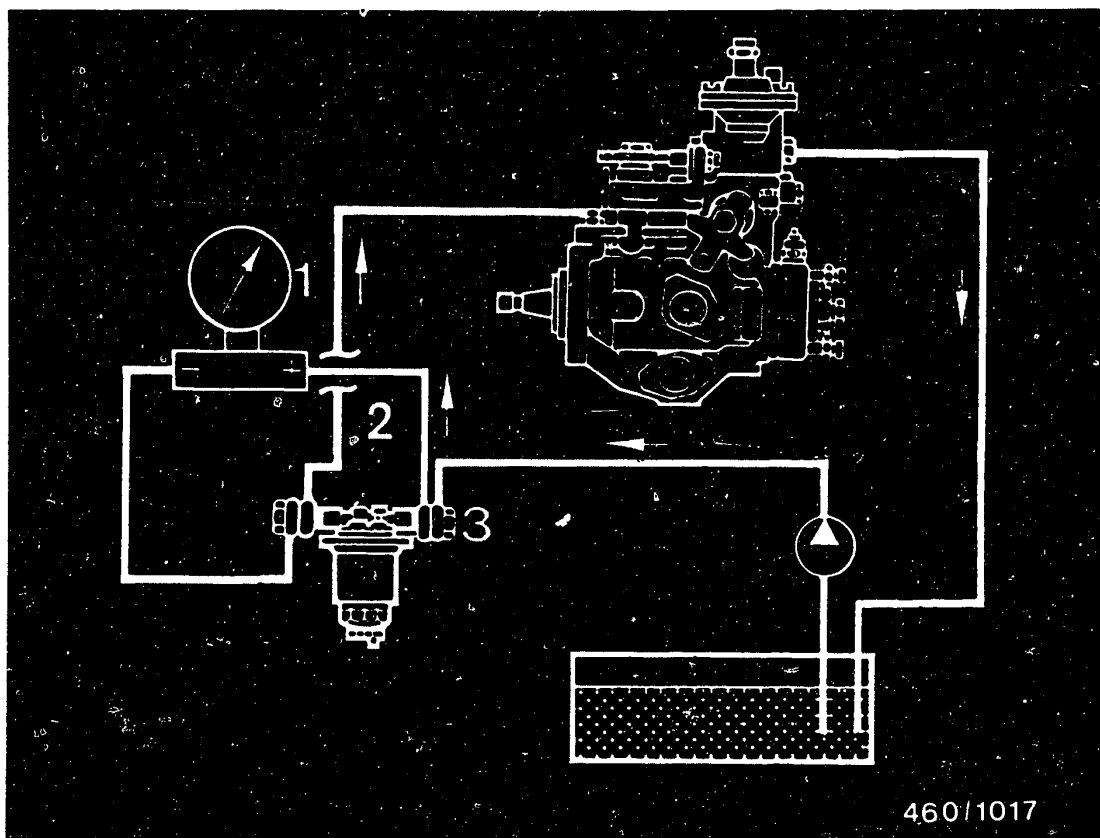
Tighten union nuts on the supply lines to 25 Nm.

D6

Test injection nozzles

Volvo 240D, 740D + 760D-Turbo





- 1 = Differential pressure gauge
- 2 = Filter outlet
(Use inlet union and overlong inlet-union screw 2 443 456 020.)
- 3 = Filter inlet
(Use inlet union and overlong inlet-union screw 2 443 456 020.)

22. Connection diagram for filter test (differential pressure test)

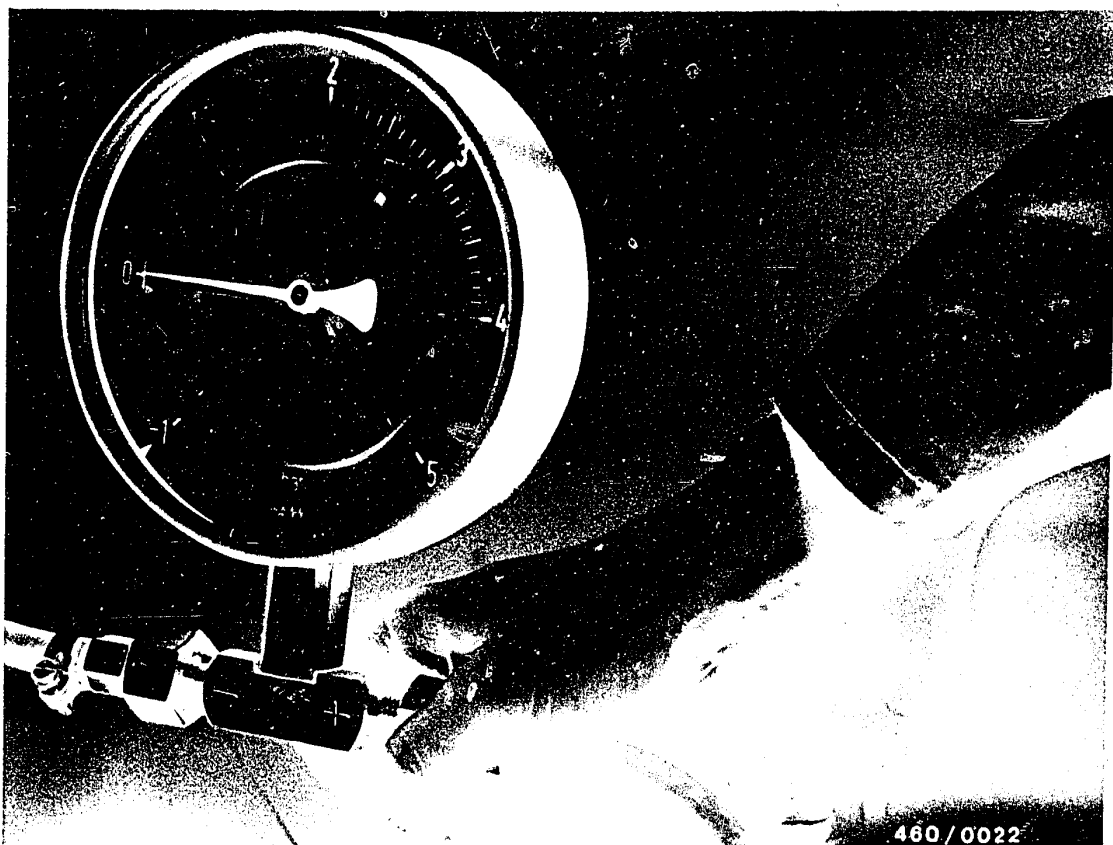
Connect the differential pressure gauge to the fuel filter using appropriate connectors.

D7

Check fuel filter

Volvo 240D, 740D + 760D-Turbo





Connect the (+) side of the differential-pressure gauge to the fuel filter inlet. Fit the (-) connection of the pressure gauge to the filter outlet. See connection diagram.

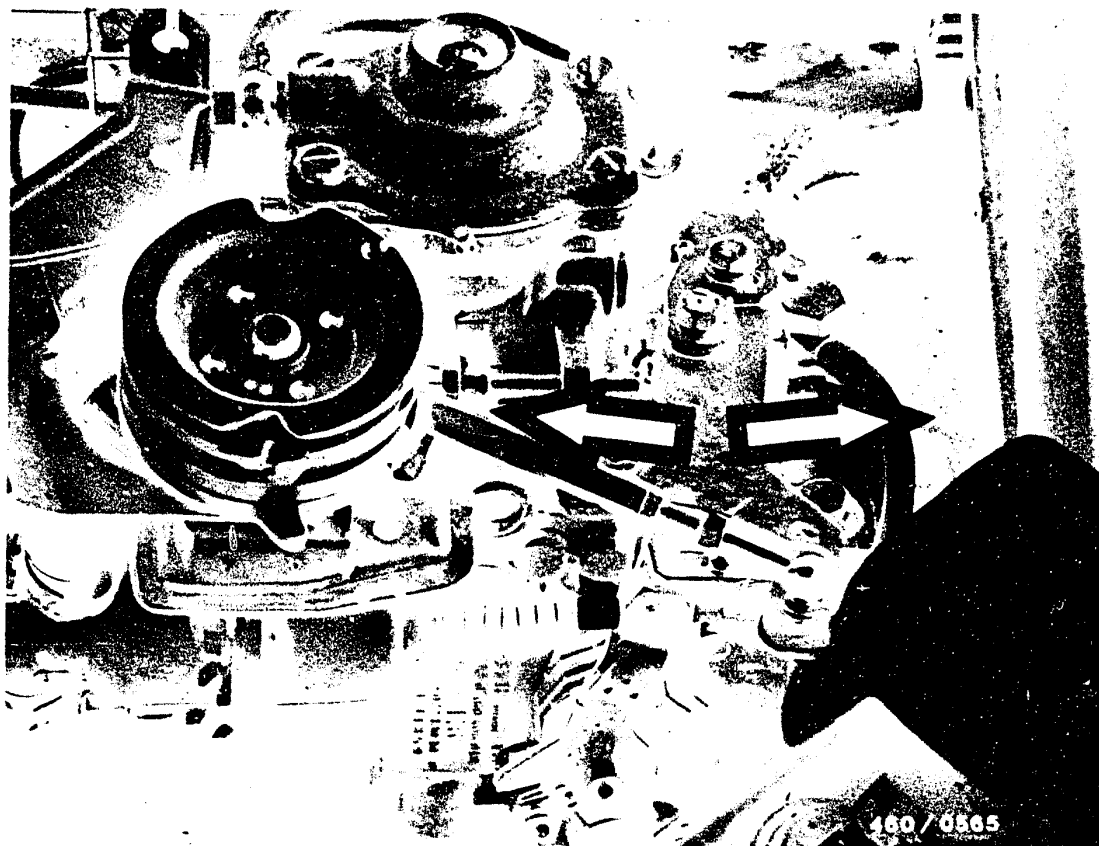
Run engine until you are sure that there is no air in the fuel system.

D8

Check fuel filter

Volvo 240D, 740D + 760D-Turbo





Move injection-pump control lever briskly (approx 1 second) from the idle-stop to the maximum-speed stop.

Release control lever and read off differential pressure on pressure gauge.

The differential pressure may be max. 0.3 bar.
If this value is exceeded, replace filter. Remove test connections.

If necessary, bleed fuel system.

D9

Test fuel filter

Volvo 240D, 740D + 760D-Turbo



23. Check pre-heating system

23.1 Necessary test equipment

Voltmeter/ammeter e.g. ETT 011.00 0 684 101 100

23.2 Workshop information

We recommend the the "R"-type sheathed-element glow plugs be replaced every 45.000 km.

Note:

If the start of delivery is incorrectly adjusted, this may considerably shorten the service life of the sheathed-element glow plug.

23.3 Pre-heating times

The on-time of the preheating system is dependent on the coolant temperature.



Rechecking the preheater system

The preheater system is turned on when the glow-plug and starter switch is in position II.

How long the preheater system is turned on depends upon the temperature of the coolant.

Pre-heating times: Duration (sec.) approx.

°C	240D 78 - 82	240D/740D 760D-Turbo 82 →
-20	45	9
0	25	6
+20	15	4
+50	0	0

After the indicator lamp goes out, the glow plugs remain on for a further 0...14 sec. (depending on coolant temperature).

The preheating system is in operation during cranking. If, after the indicator lamp has gone out, the starting motor is not operated, the preheating system switches off automatically after a delay.

Connected between glow-duration relay and power relay is a cut-off relay which breaks the circuit as soon as the alternator is charging (only on 240D 78 - 80).

Run the test with the engine cold, i.e. with a coolant temperature less than + 40°C.

Does the preheater system turn off automatically during the test?

Turn the starting key back into setting I for the glow-plug and starter switch. Then turn it back into the driving position.

D11

Check preheating system
Volvo 240D, 740D, + 760D-Turbo



Checking of glow-duration relay and glow-plug indicator lamp

Connect test lamp to electrical connection of a sheathed-element glow plug and ground.

Turn glow plug and starter switch to driving position II.

Test lamp and glow-plug indicator lamp do not light up.

Only glow-plug indicator lamp lit.

Only test lamp lit.

Test lamp and glow-plug indicator lamp lit?

yes

Test lamp and glow-plug indicator lamp not lit.

1. Check for open circuit in lead between fuse box and glow-duration relay term. 15.
Eliminate open circuit.

2. Check for open circuit in lead term. 31 on glow-duration relay.
Eliminate open circuit.

3. Glow-duration relay defective; replace.

Only glow-plug indicator lamp lit.

1. Check for open circuit in lead between positive battery terminal and glow-duration relay term. 30.
Eliminate open circuit.

2. Check for open circuit in 80 A fuse on glow-duration relay.
Replace fuse.

3. Check for open circuit in lead between glow-duration relay term. G and glow plug.
Eliminate open circuit.

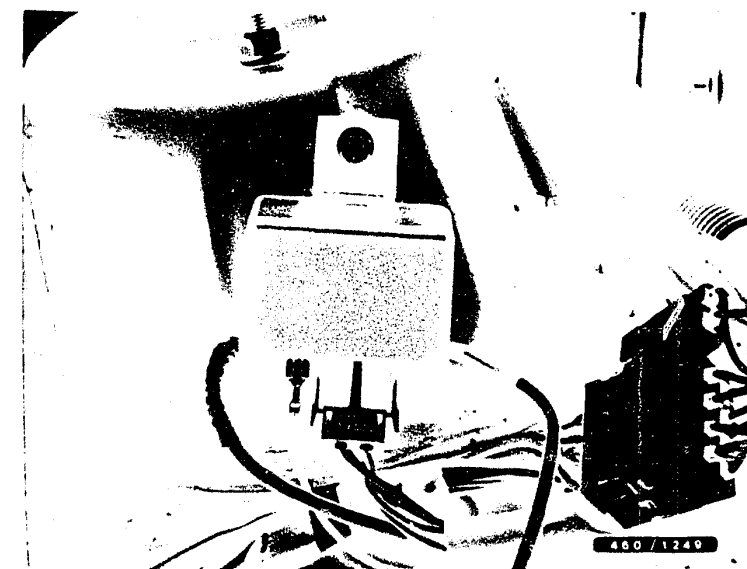
Only test lamp lit.

1. Disconnect plug from glow-duration relay and ground orange-colored lead through test lamp.

Indicator lamp lit and test lamp glowing? Control unit defective, replace.

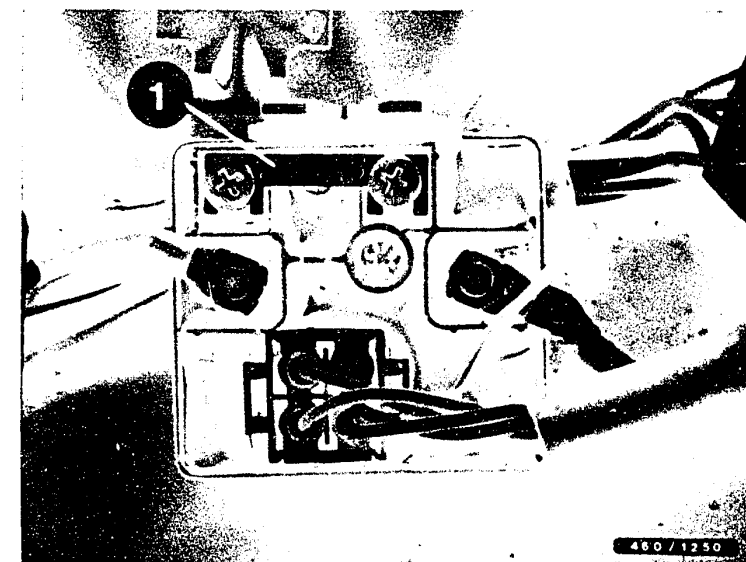
2. Check indicator lamp or lead to indicator lamp for open circuit.

Eliminate open circuit.



Installation position of glow-duration relay

1 = 80 A fuse



D12

Check preheating system
Volvo 240D, 740D, + 760D-Turbo



D13

Check preheating system
Volvo 240D, 740D, + 760D-Turbo



Check on-time

Connect test lamp to glow plug. Turn starting switch to position "0", then to "glow-plug position".

Note:

After the indicator lamp goes out, the test lamp must remain lit for a further 0...14 sec. (dependent on coolant temperature).

On-time obtained depending on temperature?

yes

Check safety switch-off of glow-duration relay.

Disconnect lead from temperature sensor and protect against contact with ground.

Connect test lamp to glow plug. Turn starting switch to "glow-plug position".

Do glow-plug indicator lamp and test lamp go out after approx. 25 sec.?

yes

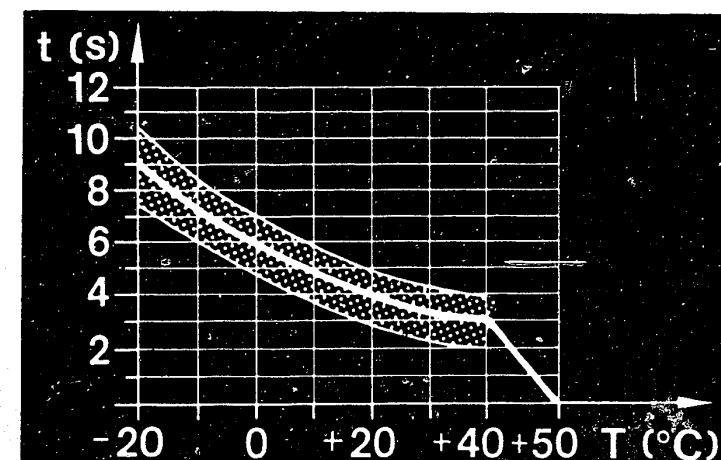
1. Repeat test with new glow-duration relay.

2. If the preheating time is still not obtained, replace coolant-temperature sensor.

no

no

Glow-duration relay defective; replace

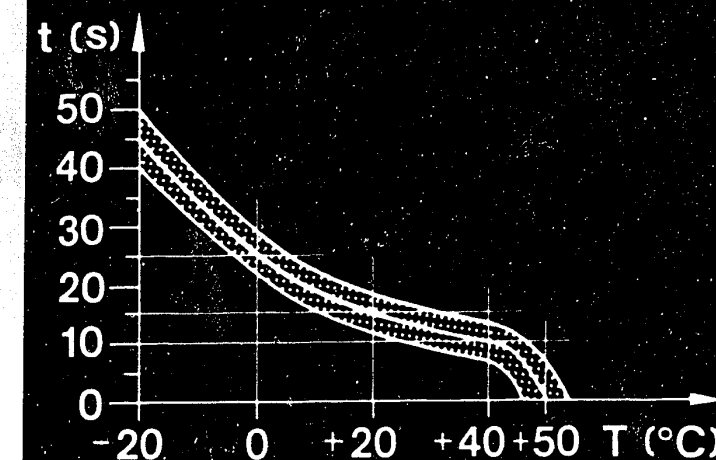


460 / 1251

240D/740D → 82
760D-Turbo

On-time of glow-plug indicator lamp
t=Glow duration
T=Coolant temperature

240D-1978-82



460 / 1252

D14

Check preheating system

Volvo 240D, 740D, + 760D-Turbo



D15

Check preheating system

Volvo 240D, 740D + 760D-Turbo



Check glow plugs

Connect ammeter (e.g. ETT 011.00) into lead for glow plugs.
Disconnect plug from engine-temperature sensor.
Turn starting switch to "glow-plug position".
Read off current consumption.

Set value: approx. 72 A

Set value obtained?

no

Current consumption after stabilization approx. 12 A per glow plug. If current consumption of glow plug approx.

60 A=one glow plug defective
48 A=two glow plugs defective
36 A=three glow plugs defective.

These current readings are obtained only with a battery voltage above 11.5 V.
Glow-plug tightening torque 40 Nm. If glow plugs burned, follow instructions.

yes

Check glow-plug current with starting motor operated

Connect test lamp to glow plug.
Turn starting switch to glow-plug position and, when indicator lamp and test lamp go out, turn further to starting position.

Does test lamp light up again?

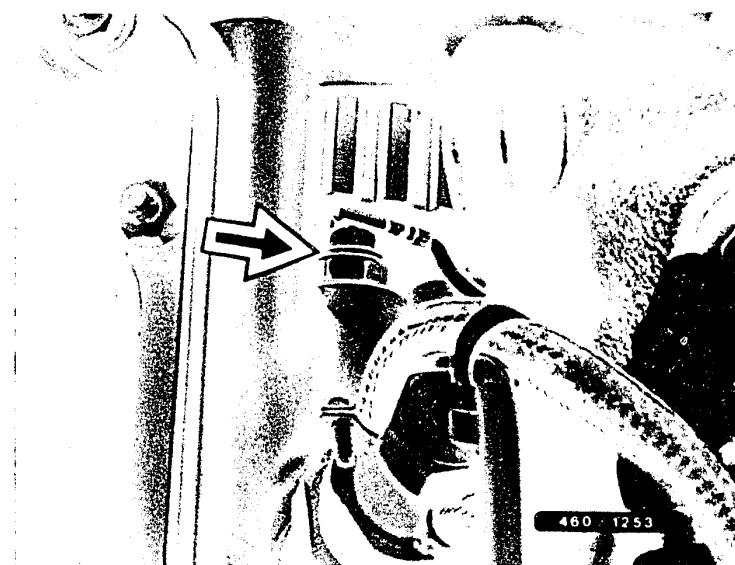
no

1. Voltage at glow-duration relay term. 50. Glow-duration relay defective; replace.

2. No voltage at term. 50; check lead (blue-green) for open circuit.

Eliminate open circuit.

yes



Temperature sensor = arrow

D16

Check preheating system
Volvo 240D, 740D, + 760D-Turbo



D17

Check preheating system
Volvo 240D, 740D, + 760D-Turbo



Glow-plug indicator lamp lit when starting a warmed-up engine.

Disconnect lead from temperature sensor and ground.
Turn starting switch to position II.

If indicator lamp remains "dim", temperature sensor defective - replace.

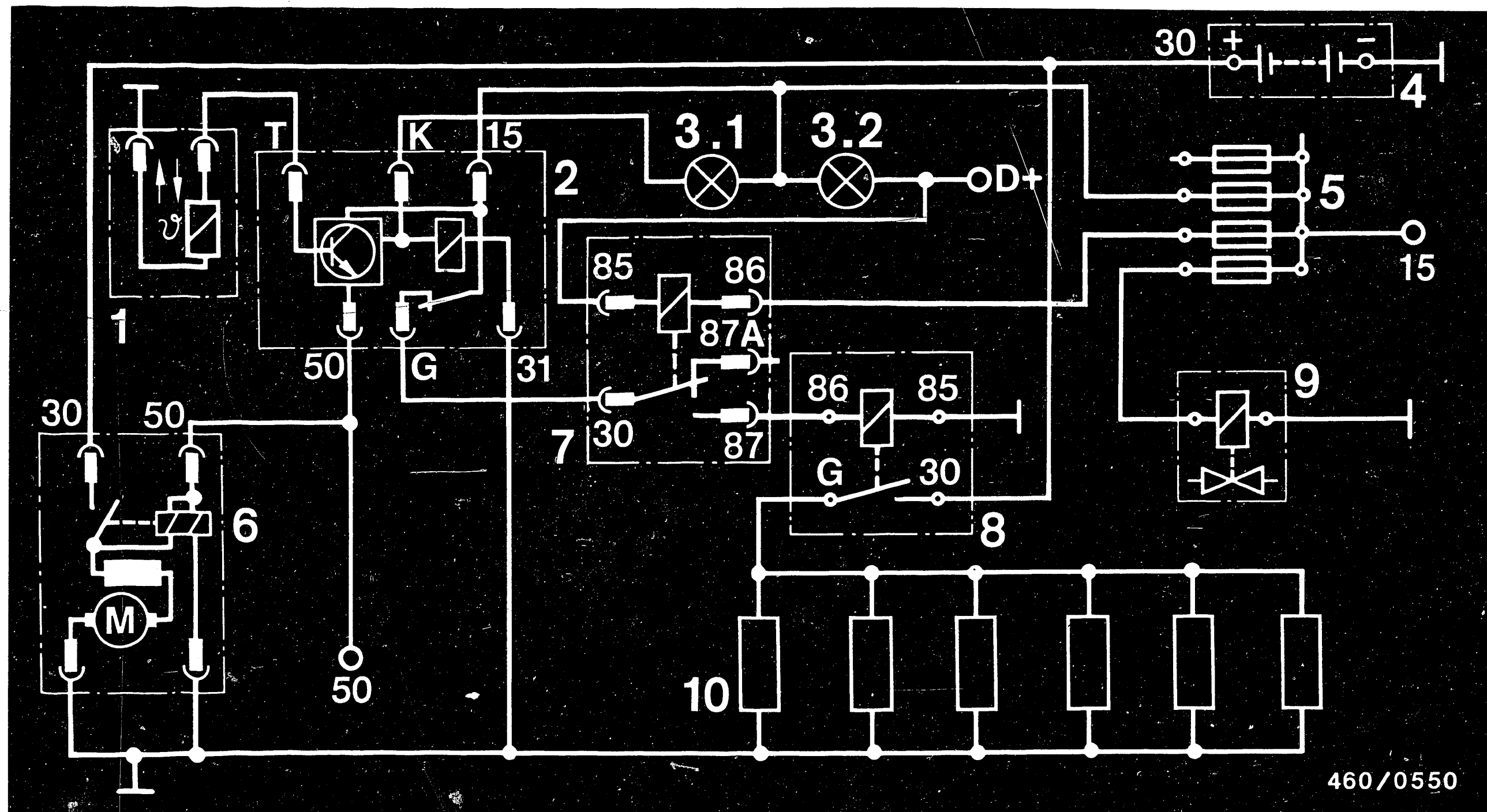
If indicator lamp lit, disconnect plug from glow-duration relay.

Indicator lamp goes out: glow-duration relay defective - replace.

Indicator lamp still lit: short circuit in lead between indicator lamp and plug.

Testing of preheating system completed.





460/0550

Terminal diagram of preheating system, Volvo 240 D (1978 - 1980)

1 = Temperature sensor
2 = Glow-duration unit

3.1 and 3.2 = Preheating repeater lamp
4 = Battery

5 = Fuse board
6 = Starting motor
7 = Cutoff relay

8 = Power relay
9 = Solenoid-operated valve
10 = Glow plug

Cutoff relay (7) is shorted to ground through regulating switch/generator when generator is not charging.

D19

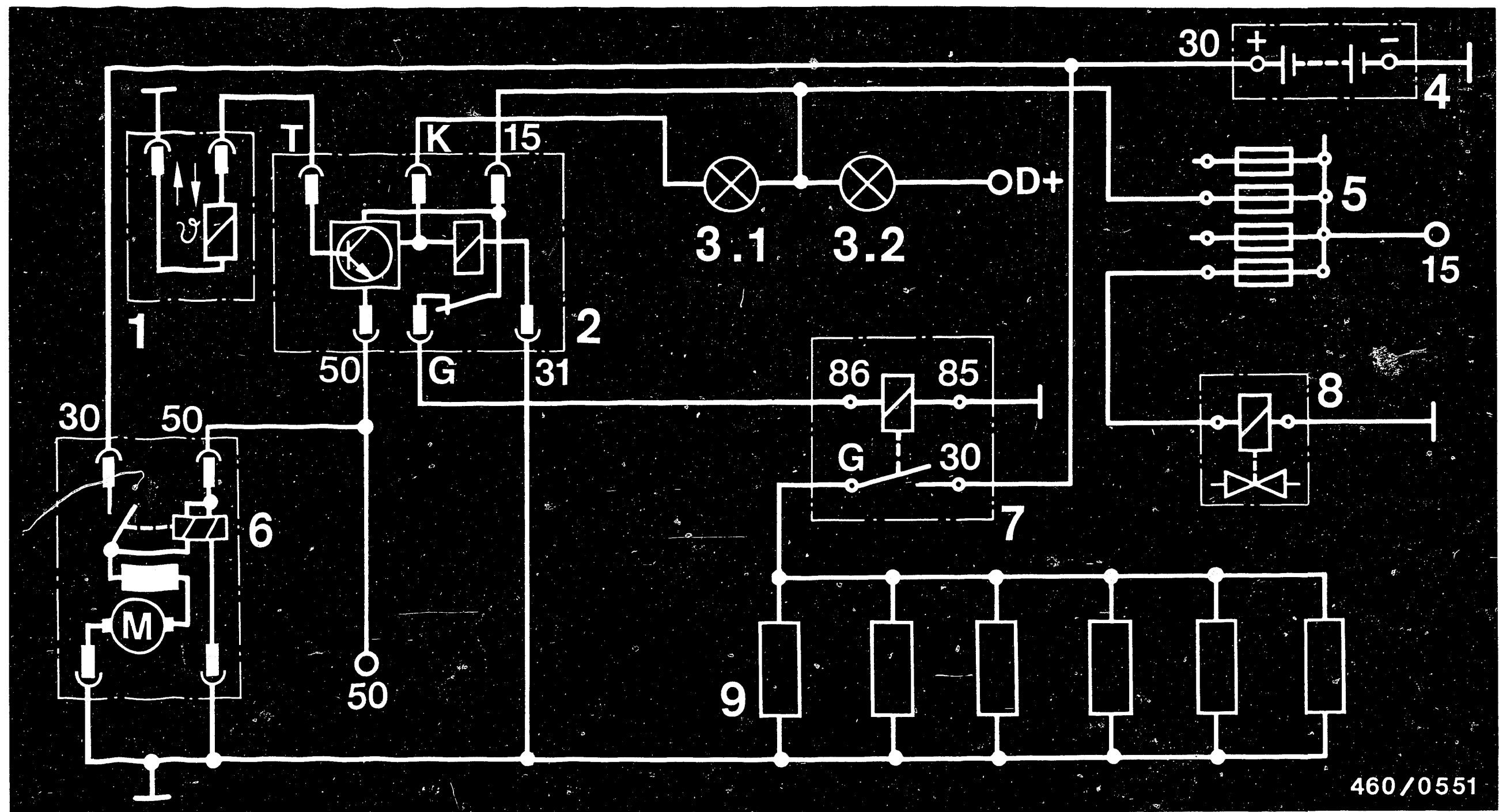
Test preheating system
Volvo 240D, 740D, + 760D-Turbo



D20

Test preheating system
Volvo 240D, 740D, + 760D-Turbo



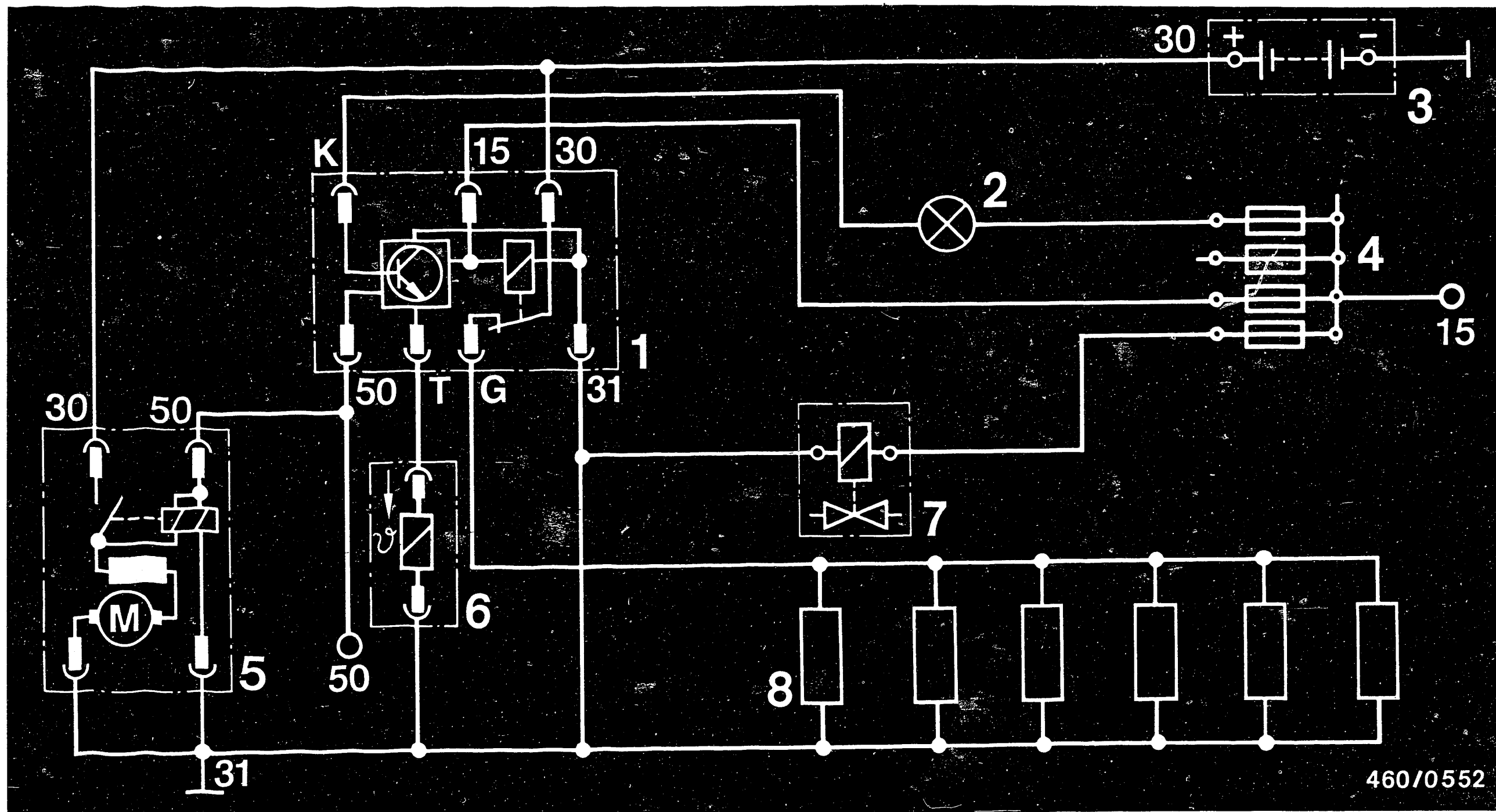


Terminal diagram of preheating system, Volvo 240 D (1981 →)

4 = Battery
5 = Fuse board
6 = Starting motor

7 = Power relay
8 = Solenoid-operated valve
9 = Glow plugs





460/0552

Terminal diagram of preheating system (Volvo 740D / 760D-Turbo (8.82 →))

1 = Glow-duration unit
2 = Preheating repeater lamp

3 = Battery
4 = Fuse board

5 = Starting motor
6 = Temperature sensor

7 = Solenoid-operated valve
8 = Glow plugs

D23

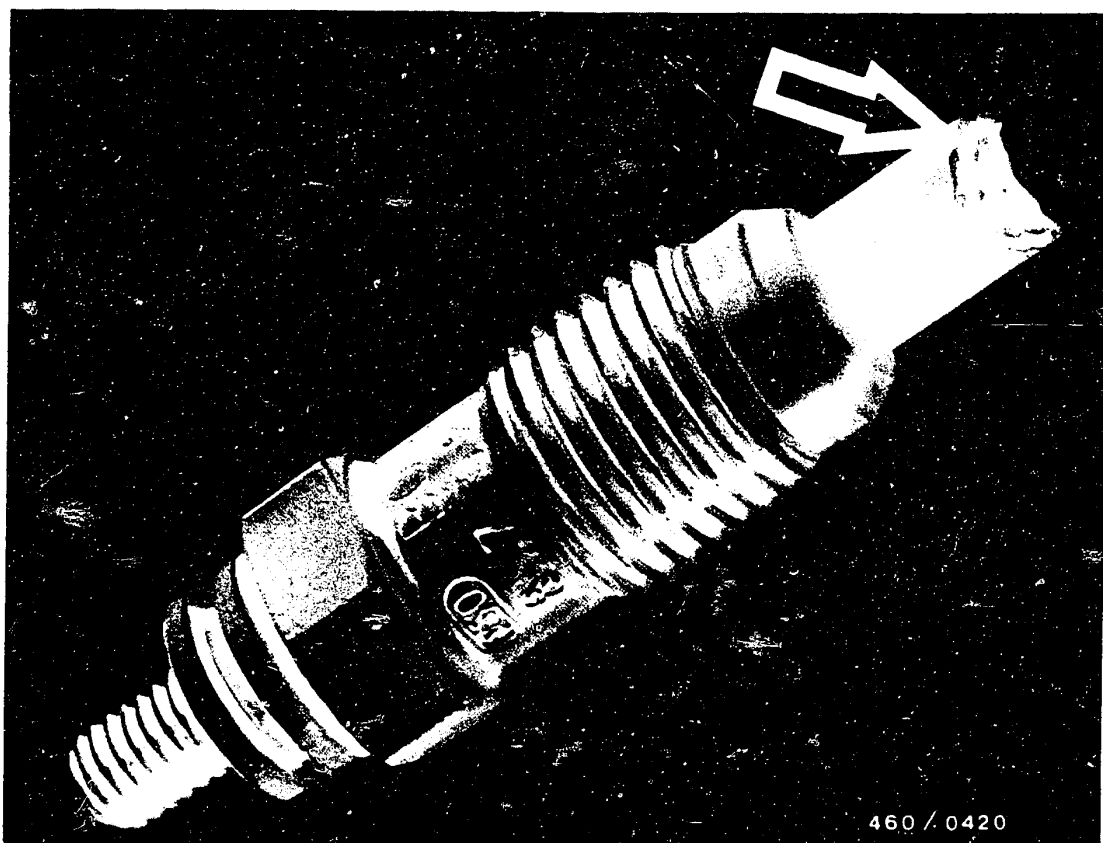
Test preheating system
Volvo 240D, 740D, + 760D-Turbo



D24

Test preheating system
Volvo 240D, 740D, + 760D-Turbo





Note:

Glow plugs with burned elements

Glow plugs with burned elements are frequently the result of troubles with the injection nozzle.

If glow plugs are found to have burned elements (arrow), it is not sufficient simply to replace them. The injection nozzles must also be tested for spray pattern, chattering, pressure and leaks.

E1

Check pre-heating system

Volvo 240D, 740D + 760D-Turbo



24. Check timing device

In distributor-type fuel-injection pumps VE..F.. the timing device is integral with the fuel-injection pump.

In order to test the timing device, it is necessary to remove the fuel-injection pump.

Perform the test on the injection-pump test bench.





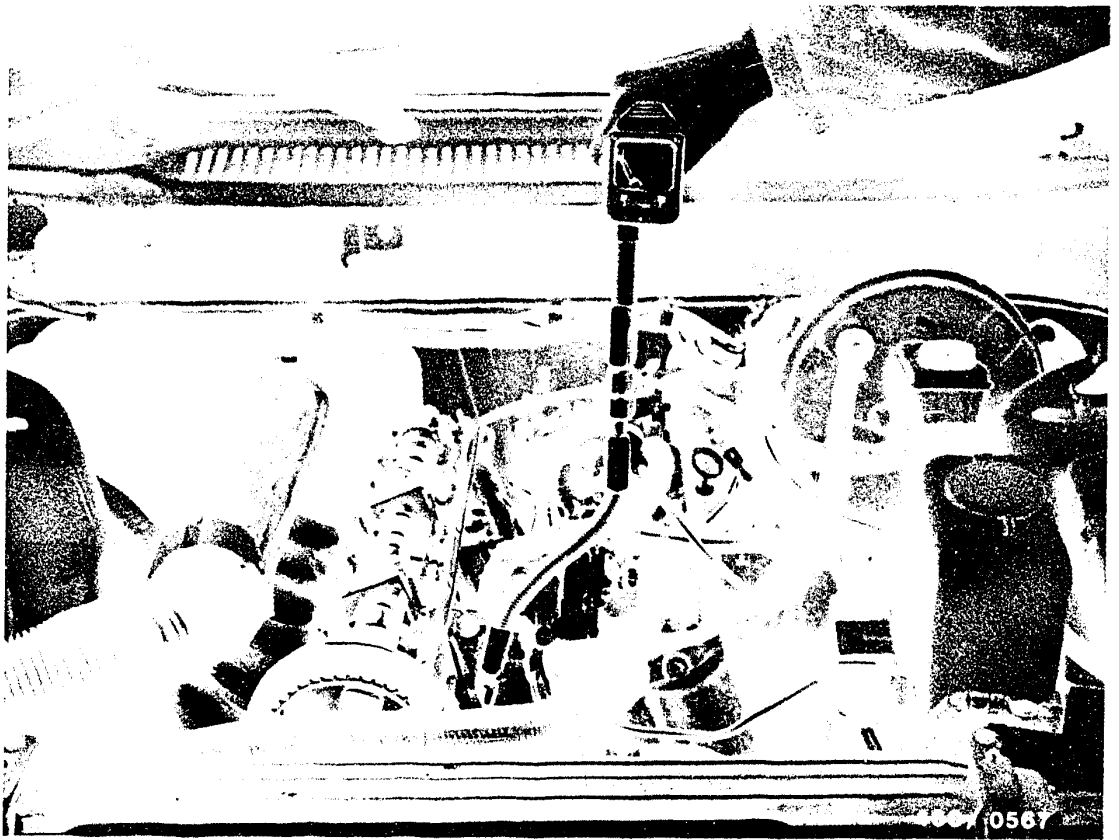
25. Measure engine compression and compression loss

25.1 Measure engine compression

Fit new chart in compression tracer. Mount high-pressure hose on tracer. Switch off engine.

In order to prevent fuel from being injected, remove connecting cable from shutoff magnet on distributor-type fuel-injection pump (picture).





Remove vacuum pump with pump ram.

Unscrew nozzle holder and use suitable connection nipple for compression tester.

Using the starting motor, turn the engine over several times so that loose residues are removed from the compression space.

Screw in connection nipple. (Make sure there is a good seal when screwing into the bore of the nozzle holder).

Mount high-pressure hose of compression tester on connection nipple.

E4

Measure engine comp. and comp. loss
Volvo 240D, 740D, + 760D-Turbo



During the following operation, note first compression stroke.

Operate starting motor until there is no longer any detectable rise in pressure on the compression tracer.

Bleed compression tracer by pressing on bleeder valve.

The pointer returns to the starting position.

Move chart onto next position.

Fit connection nipple to the other cylinders and repeat measurement.

<u>Test specifications:</u>		
<u>Engine type</u>	<u>Compression pressure</u>	<u>Allowable difference between cylinders</u>
D20/D24	28...34 bar	max. 5 bar
D24 Turbo	24...32 bar	max. 8 bar

E5

Measure engine comp. and comp. loss

Volvo 240D, 740D, + 760D-Turbo



25.1.1 Evaluation of chart

1. Normal pressure rise

If piston rings and valves are in good condition, the first compression stroke shows the highest pressure increase.

During the following compression strokes the compression builds up to the maximum pressure.

2. Gradual pressure rise

If, from the start, the compression increases only gradually on each piston stroke, this points to burnt valve seats or defective valve guides.

3. Low maximum pressure

If the maximum pressure obtained is too low on all cylinders, this points to defective pistons, piston rings or valves.

If the compression is too low on two neighbouring cylinders, this points to a leaky cylinder head gasket.



4. Varying compression

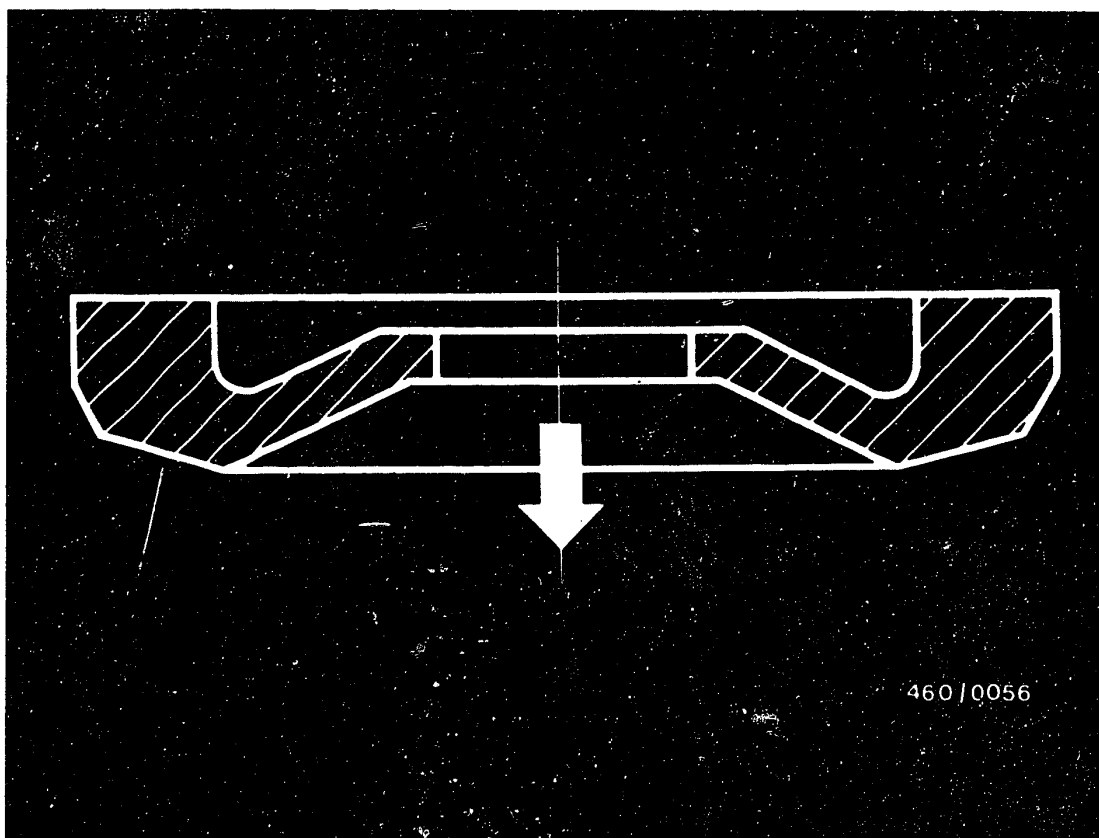
If one cylinder shows a clearly lower compression, proceed as follows: fill in 2-3 cm³ of engine oil through the opening of the sheathed-element glow plug or nozzle-holder assembly and operate starting motor briefly.

Repeat measurements and compare charts. If there is a clear increase in compression during the second test, then the piston rings or cylinders are worn. If there is no change in the result, then defective valves are the cause.

5. Uniform compression

Uniform compression is extremely important with regard to the smooth running of the engine. Maximum compression is, therefore, not the only objective.





460/0056

Putting in the fuel-injection nozzles

Before installation of the fuel-injection nozzles, put in a new heat insulator disc in the cylinder head as a shield and lateral compensation for tolerances (sealing cone 150° in the direction of the arrow).

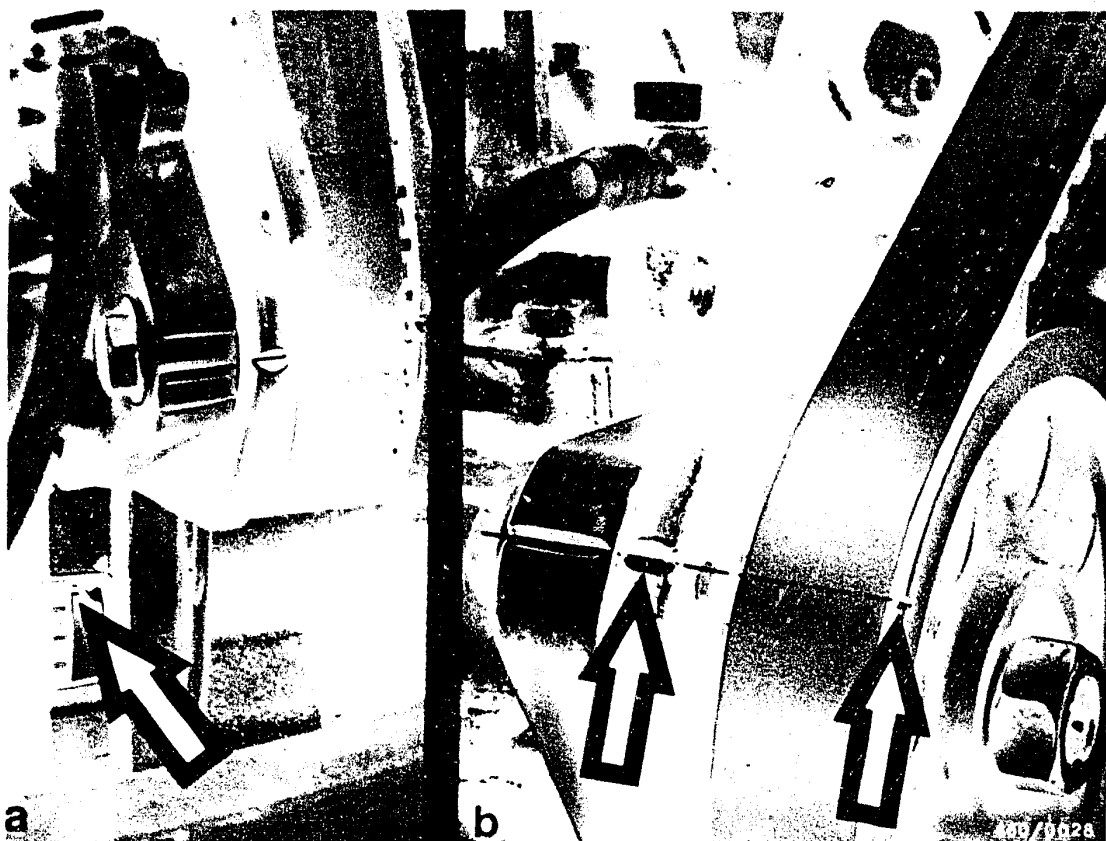
Then screw the nozzle holder into the cylinder head and tighten it to 70 Nm.

Note:

If the tightening torque is exceeded, the nozzle needle can jam.

Tighten union nuts on the supply lines to 25 Nm.





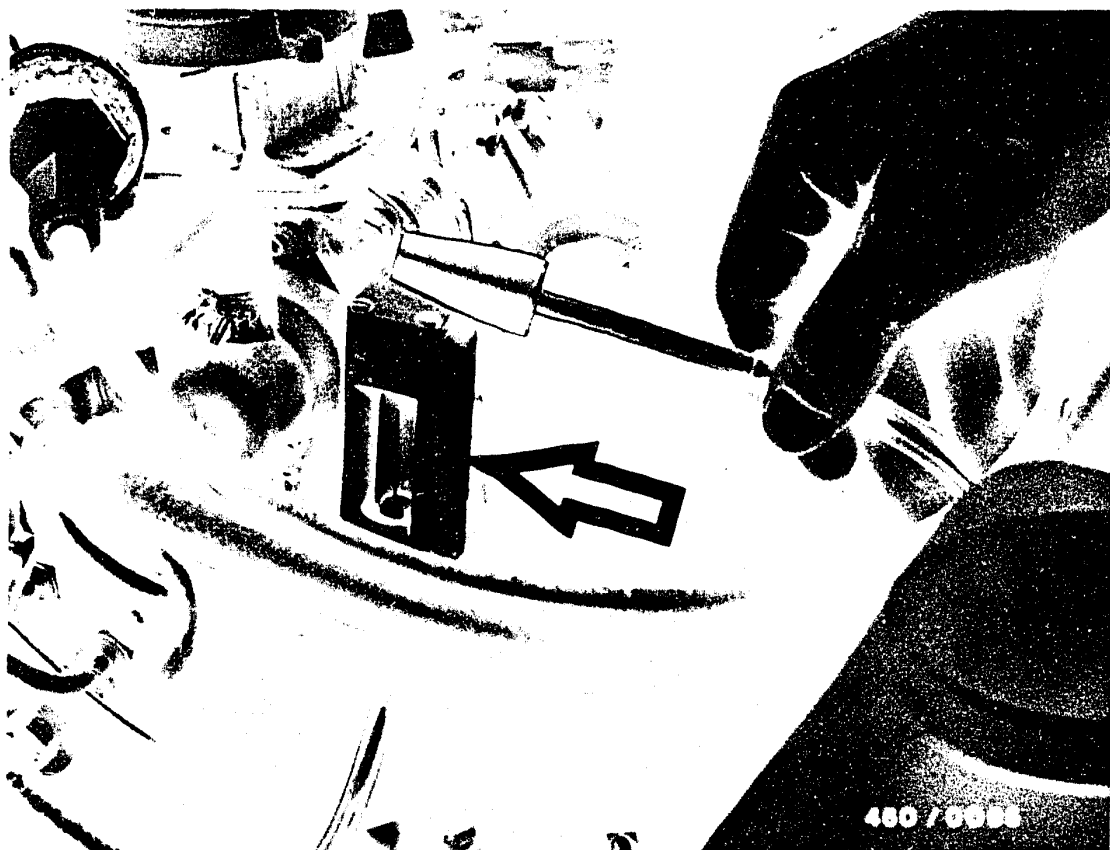
Mount vacuum pump with pump ram.

To do this, turn crankshaft to TDC on cylinder 1.

Marks on flywheel/clutch housing (picture a) and on injection-pump gear/bracket (picture b) must align.

Note:

Check O-ring seal; replace if necessary.



25.2 Measure engine compression loss

For testing, use Bosch compression-loss tester
0 681 001 901 (EFAW 210 A).

For testing, the respective cylinder must be at TDC
(TDC = top dead center) on the compression stroke.

To set this point, use DC detector 1 688 132 025
(included in accessories of compression-loss tester).

Perform test with engine at normal operating temperature
(water temperature approx. 80°C).



25.2.1 Set top dead center

Remove sheathed-element glow plug of cylinder 1.

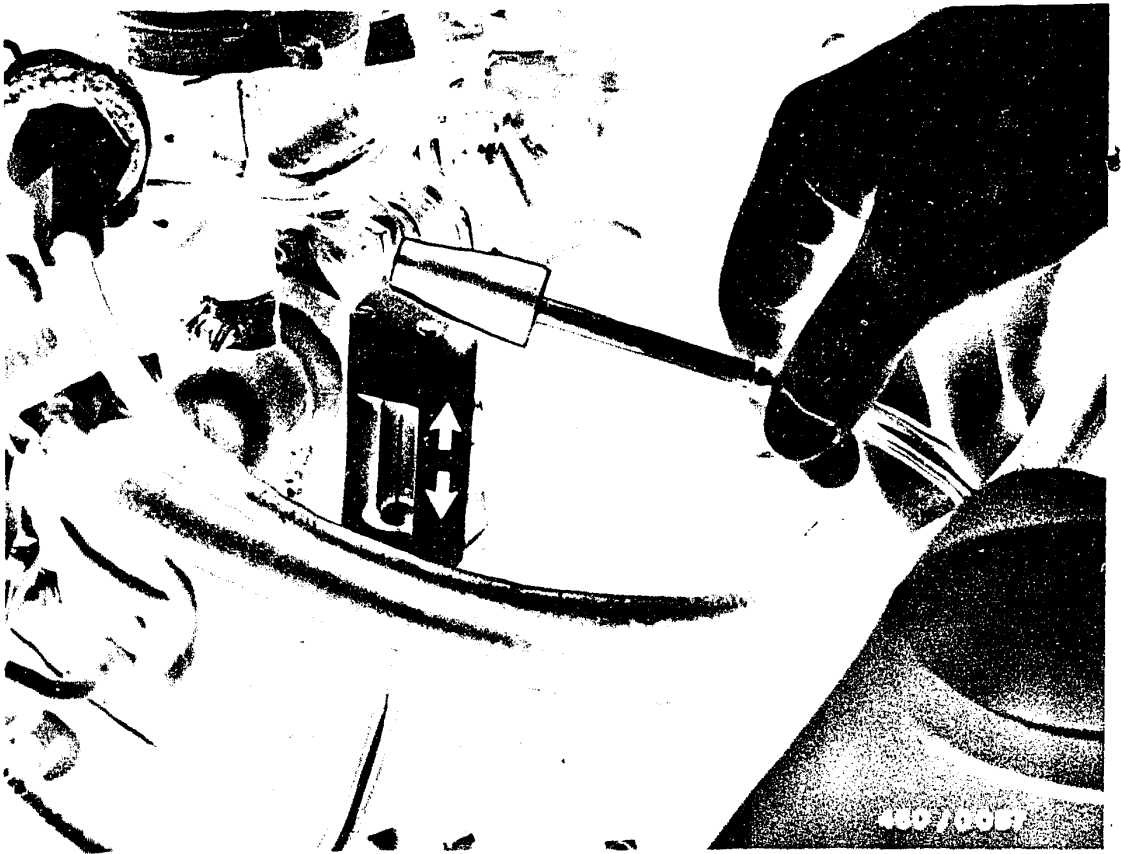
Stick rubber plug of DC detector into the bore for the sheathed-element glow plug.

Using magnetic clamp, mount glass cylinder in as vertical a position as possible in the engine compartment (arrow).

It must be possible to observe the piston in the glass cylinder.

Slowly turn the engine by hand in the engine direction of rotation (if necessary, select gear and push vehicle.)





On the compression stroke the piston of the DC detector is forced upward.

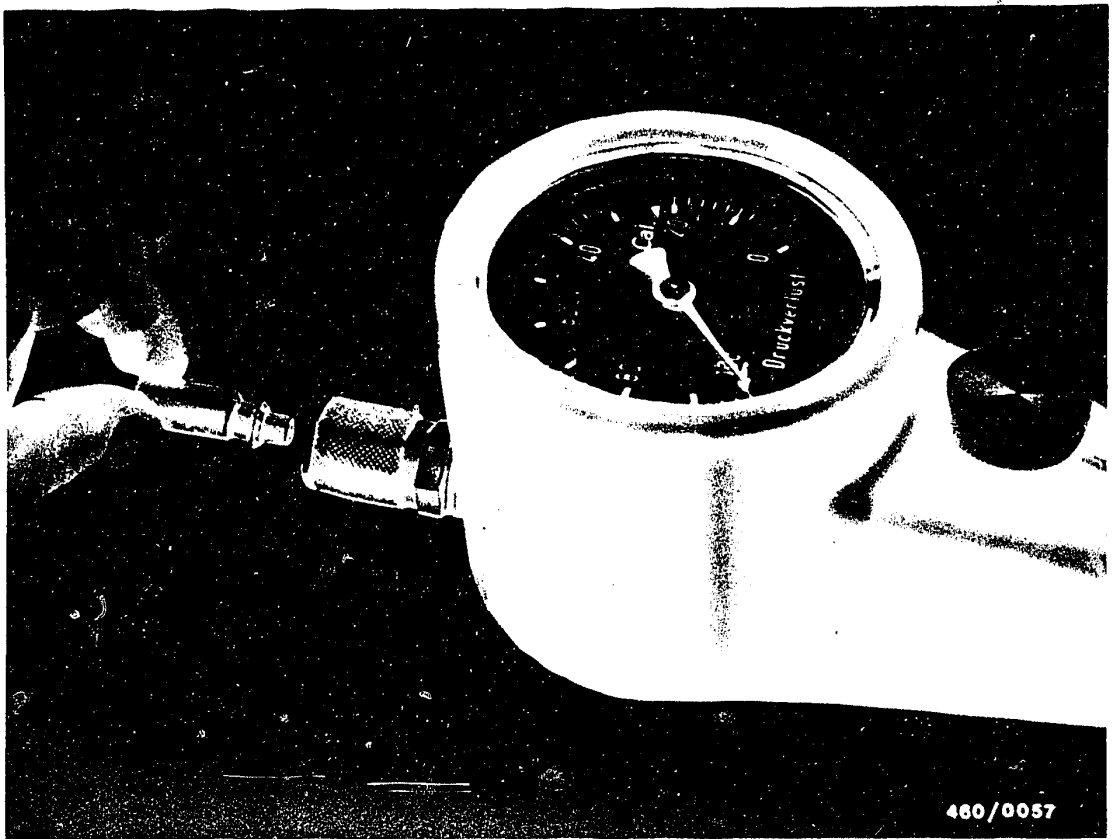
As top dead center is passed over the piston glides down immediately.

Establish top dead center by carefully turning the engine backward and forward.

E12

Meas. engine compr. and compr. loss
Volvo 240D, 740D + 760D-Turbo





25.2.2 Measure compression loss

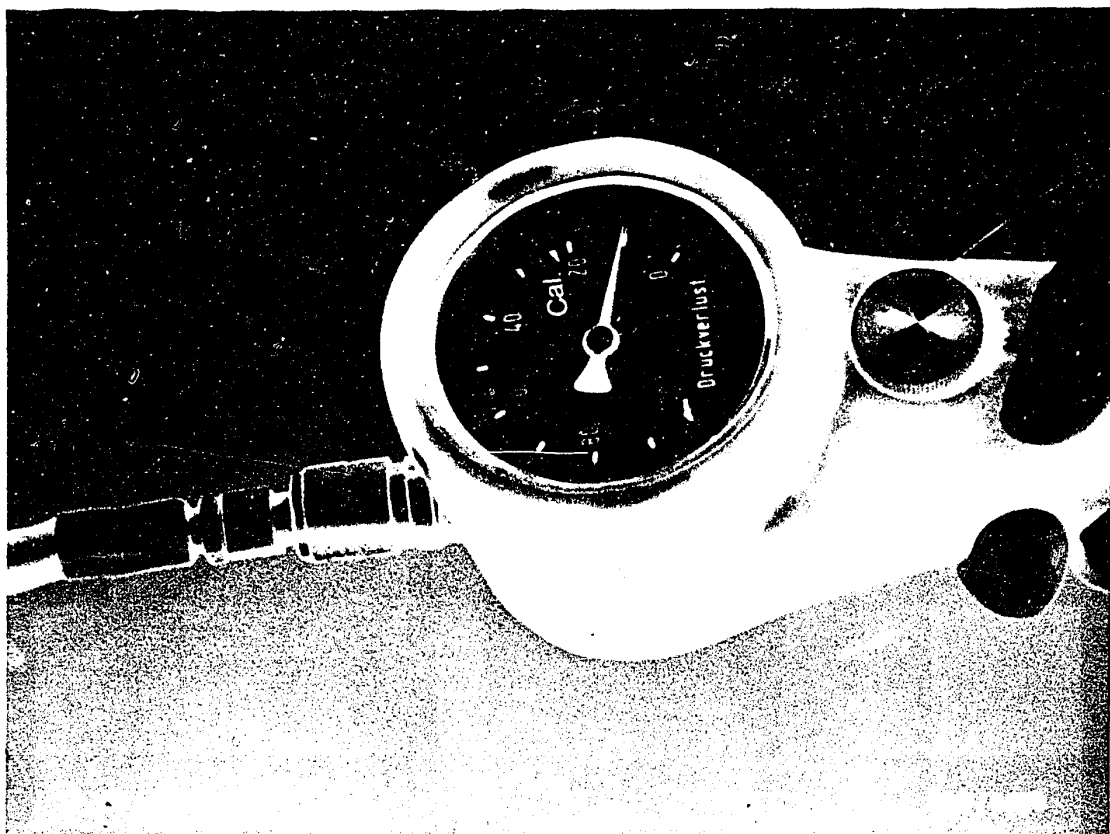
- 4. Connect tester to compressed-air mains.

Connect calibrating nozzle 1 680 363 036. Set a compression loss of $23 \pm 1\%$ (marking "Cal".) at the knurled thumbscrew on the pressure-regulating valve.
Disconnect calibrating nozzle.

Remove test nozzle.

Measuring-instrument pointer may deviate from zero point by plus/minus one graduation.
Otherwise the tester is defective.





Screw in fitting and mount test hose.
Select gear and pull on handbrake.
Connect test hose to tester.
Read off compression loss in % on instrument.

Note:

Before testing the next cylinder, turn the engine over briefly without pre-heating using the starting motor so that the oil film re-forms.



25.2.3 Evaluation of test

The compression loss indicated should not exceed 25%.

Differences of 10% between the individual cylinders can be ignored.

The causes of greater losses can be located because the air makes a noise as it escapes.

Listen at the following points:

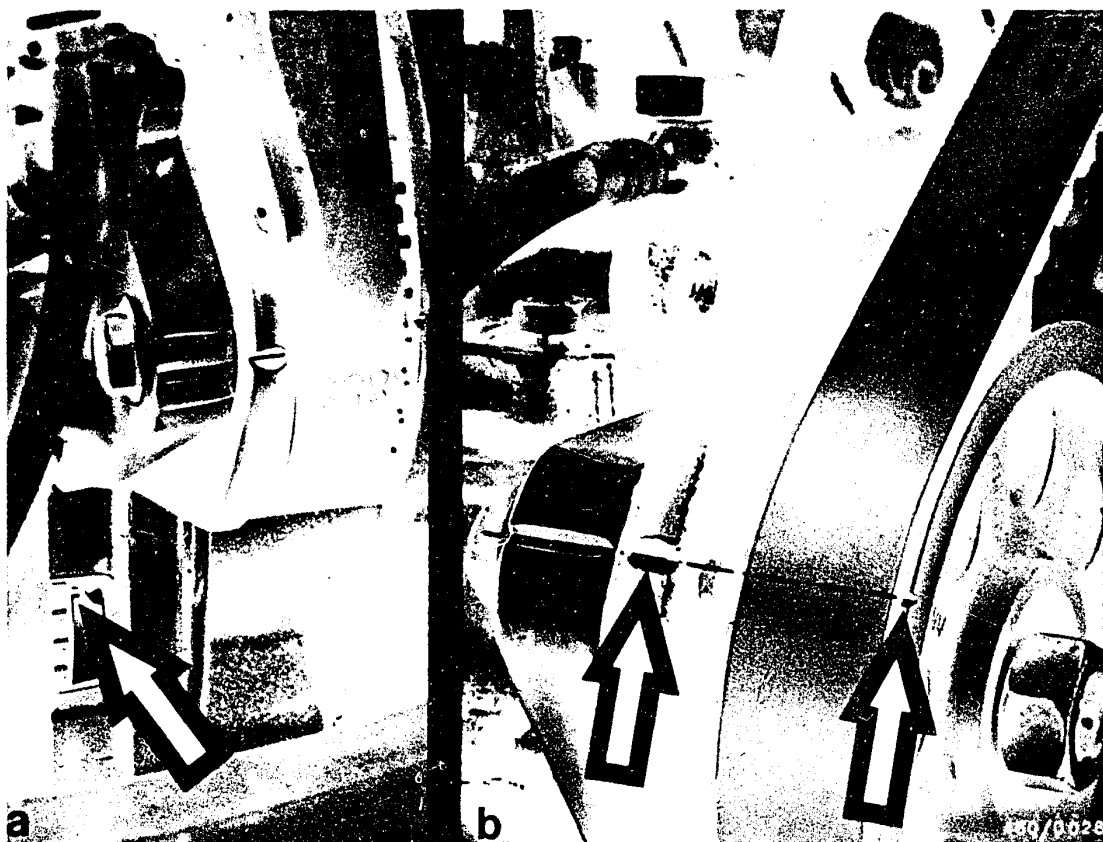
<u>Location of noise</u>	<u>Possible trouble</u>
Intake manifold (remove air filter)	Intake valve
Exhaust manifold	Exhaust valve
Oil filler neck on engine	Pistons, piston rings
Cooling water filler neck (air bubbles)	Cylinder head gasket

In order to trace the trouble even more accurately, fill approximately 2-3 cm³ of engine oil into the cylinder. Repeat test.

If there is a clear decrease in compression loss during this test, then the fault lies with the piston or with the piston rings.

New engines which have not yet been run in (less than 5,000 km) may show higher compression losses than after the running-in period.





26. Removal of fuel-injection pump

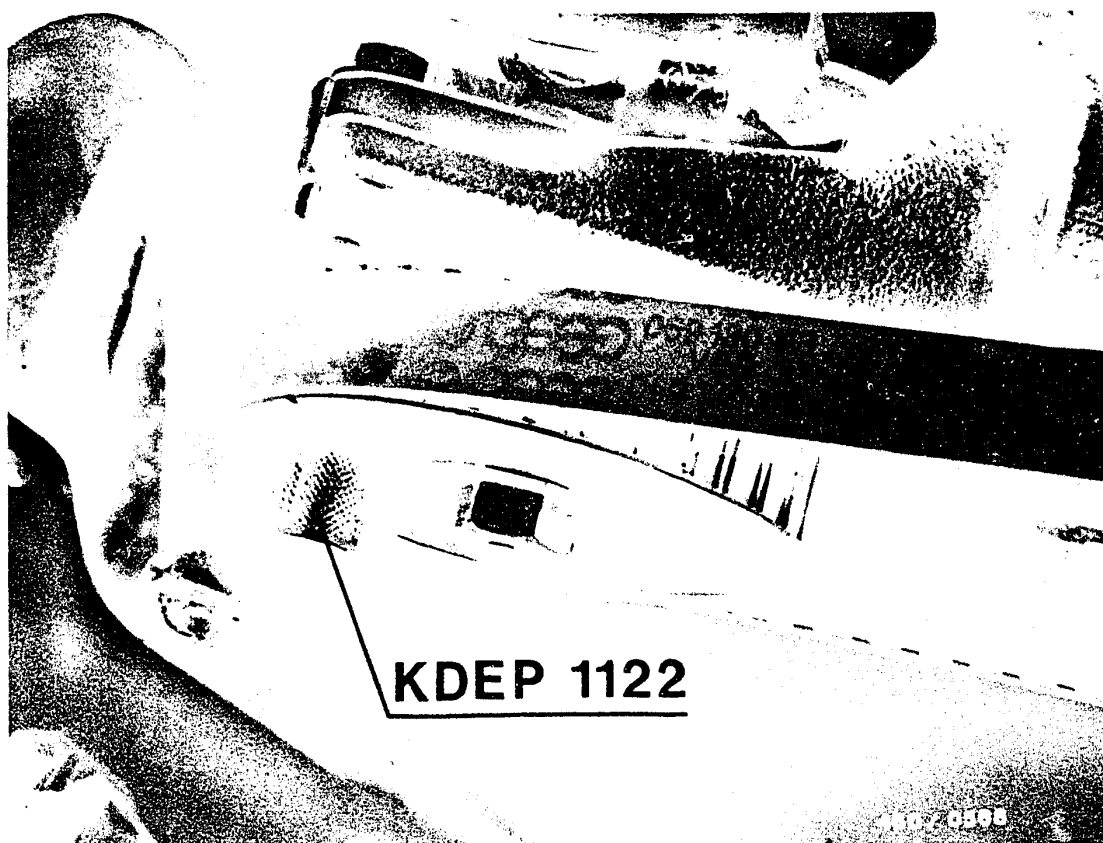
Disconnect the negative lead from the battery.

Remove the toothed-belt cover for the injection pump drive.

Turn the crankshaft to the first cylinder TDC.

The markings on the flywheel/coupling hood (Fig. a) and the fuel-injection pump gear/console (Fig. b) must align.





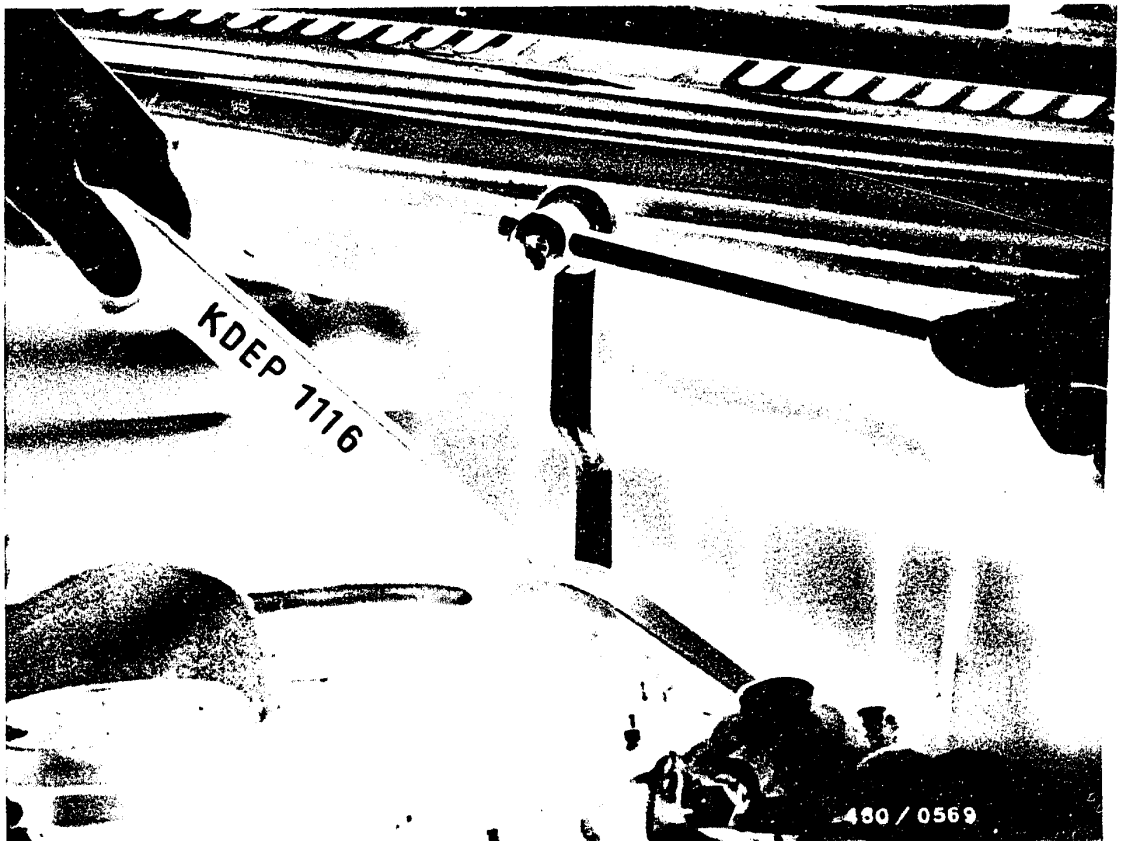
Lock injection-pump gear using setting mandrel KDEP 1122.

E17

Remove fuel-injection pump

Volvo 240D, 740D + 760D-Turbo





Lock camshaft gear with holder KDEP 1116.

Loosen camshaft gear fastening screw by means of box wrench KDEP 1120 and unscrew.

Remove camshaft gear with toothed belt from engine camshaft.

E18

Remove fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





Remove cylinder head cover.

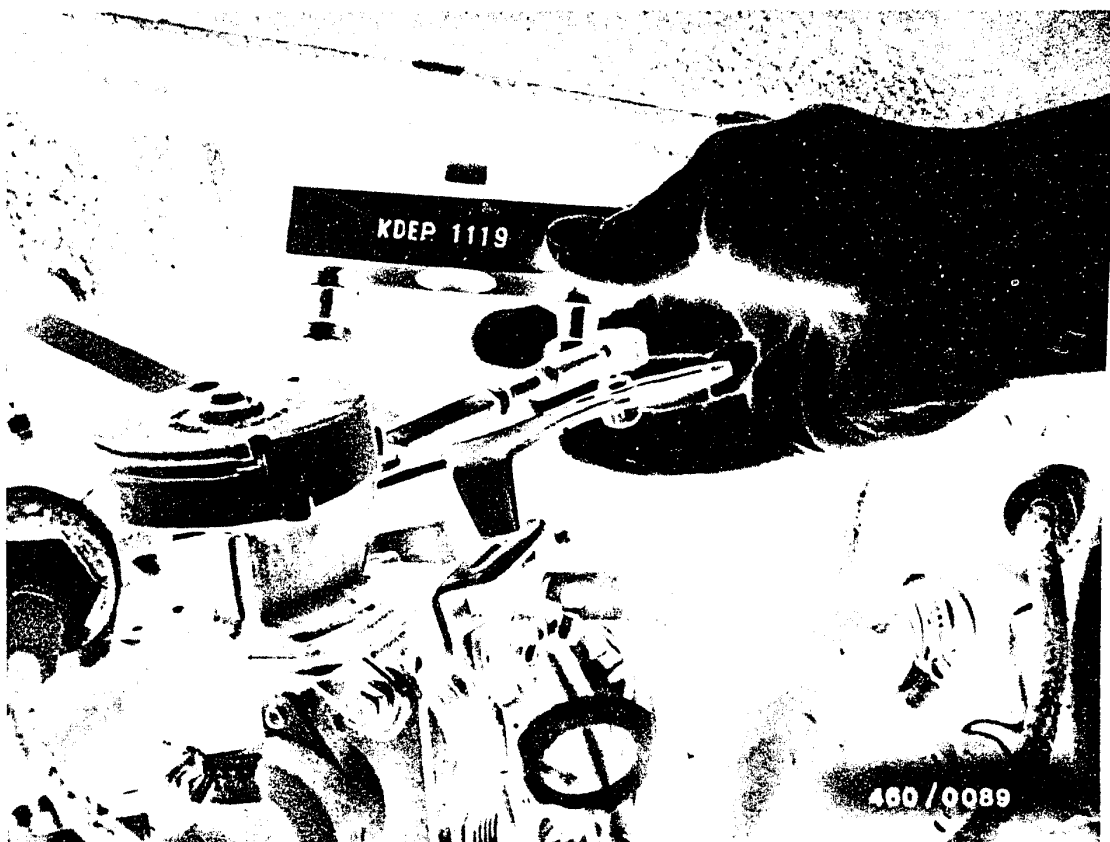
Slide setting rule KDEP 1117 into camshaft recess.

If it is not possible to introduce the setting rule, the engine timing must be corrected.

E19

Remove fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





Loosen injection-pump gear fastening screw by approx. 1/2 turn using box wrench KDEP 1120.

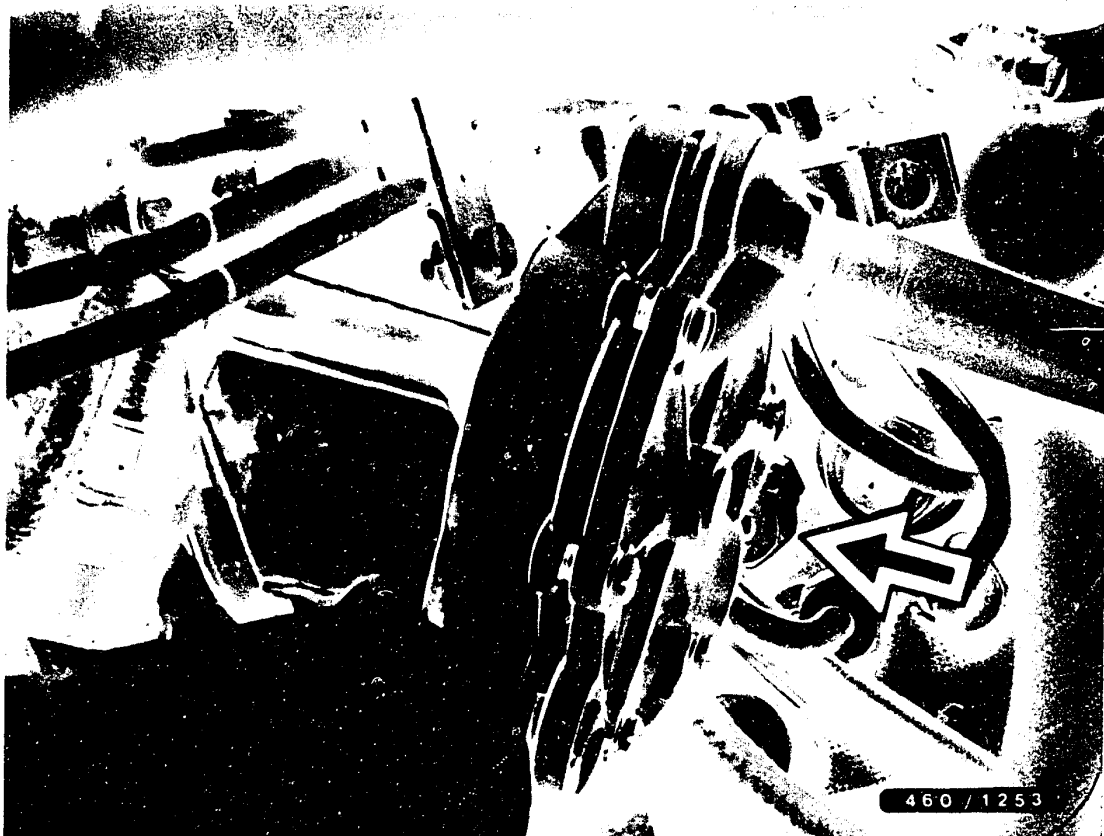
Mount puller KDEP 1119 on injection-pump gear.

Pull off injection-pump gear.

Remove puller KDEP 1119.

Unscrew fastening nut and remove injection-pump gear with setting mandrel.





Remove vacuum pump (arrow).

E21

Remove fuel-injection pump
Volvo 240D, 740D, + 760D-Turbo





Release the fuel injection lines with an open box wrench KDEP 1115. (Keep the pressure valve holder from becoming loose by holding it with a wrench.)

E22

Remove fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





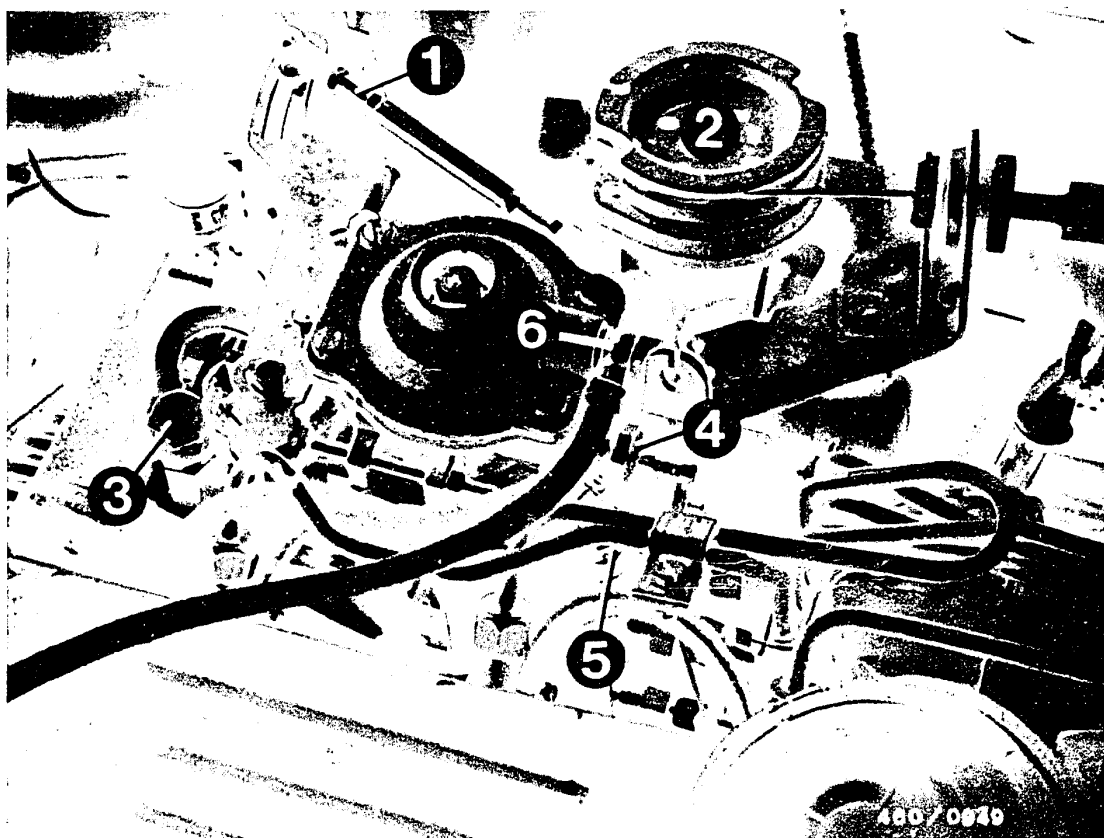
On vehicles with cruise control, disconnect vacuum hose from control box (arrow).

E23

Remove fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





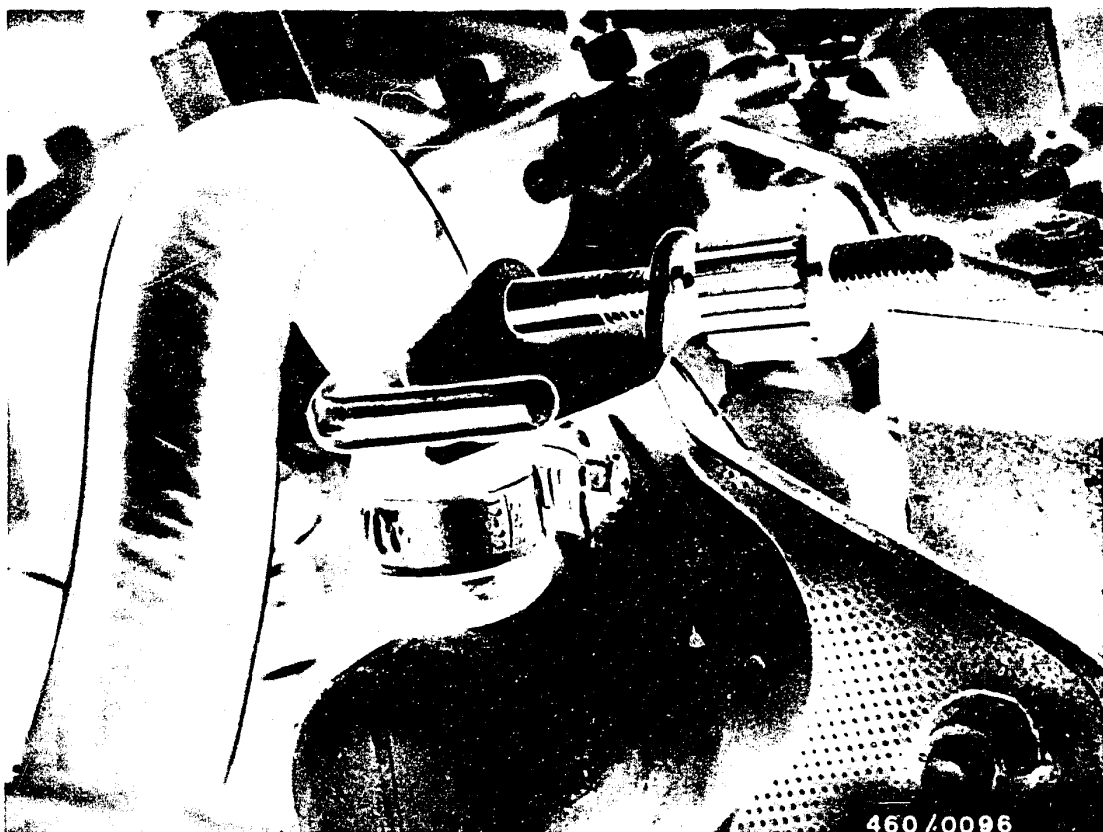
Remove the connector between the guide roller and the control lever (1), the guide roller, with the holder for the cable (2), the fuel inlet line (3), the return line (4), the lead for the electrical shutoff device (5), and the charge air pressure connection (6).

E24

Remove fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





Using commercially available hose clampers, pinch off cooling-water hoses just after injection-pump control device.

Loosen hose clips and pull off cooling-water hoses.

F1

Remove fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





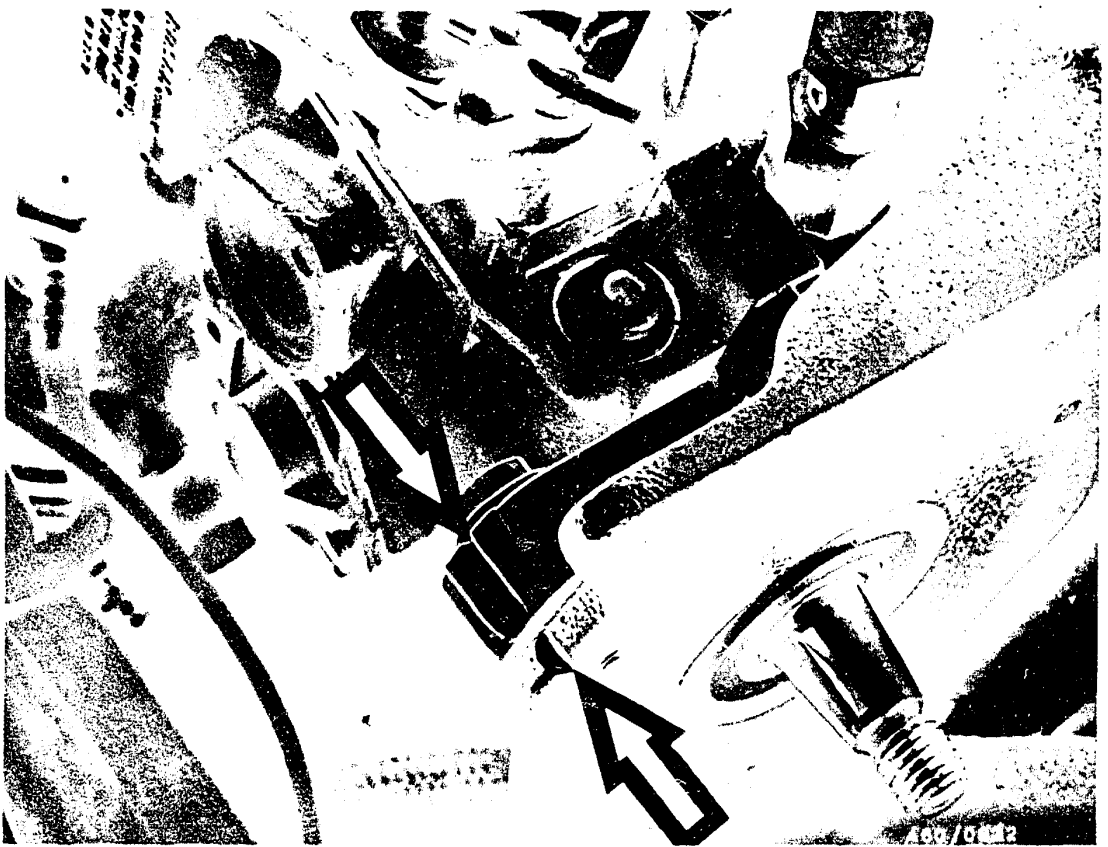
For the rear injection-pump fastening screw use socket 220 mm long for 6 mm hex. socket head.

Remove other fastening screws and remove distributor-type injection pump.

F2

Remove fuel-injection pump
Volvo 240D, 740D + 760D-Turbo



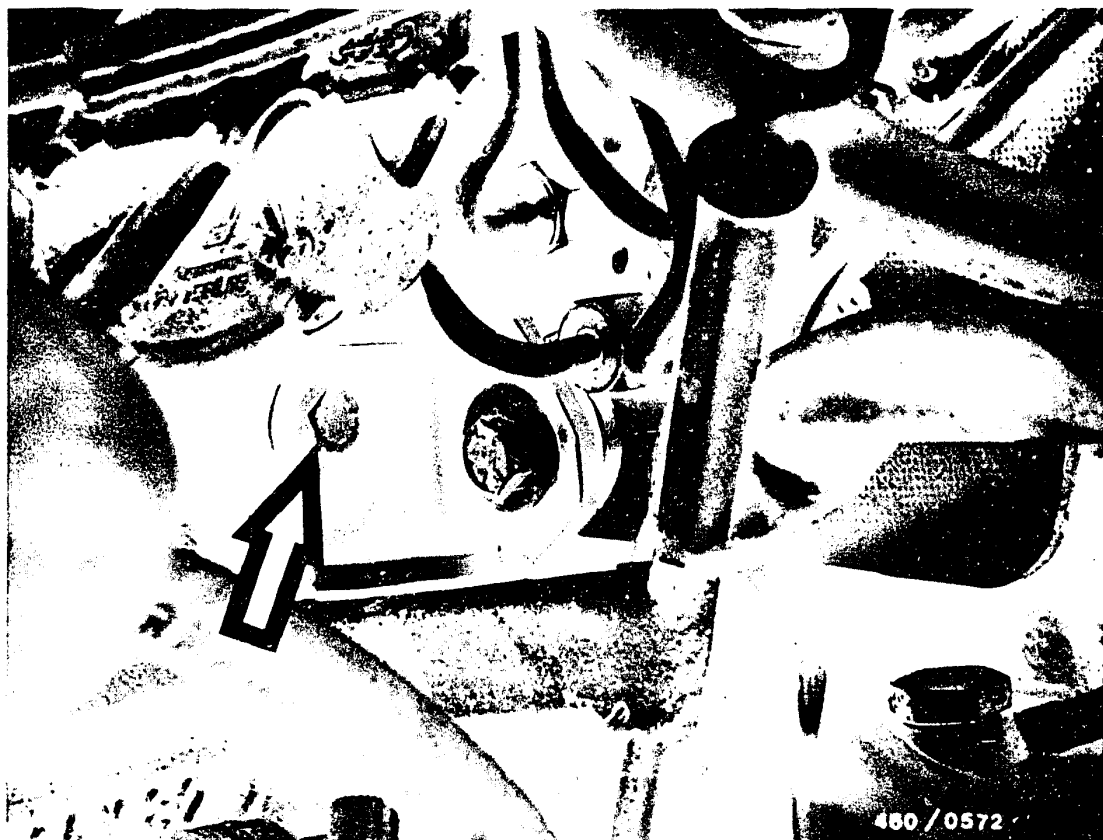


27. Install fuel-injection pump

Insert injection pump so that marks on injection-pump flange and bracket are in alignment (arrows).

Mount injection-pump fastening screws and finger-tighten.





Align support bracket on hydraulic head of injection pump so that it is up against the cylinder block and hydraulic head free of tension.

Screw down support bracket (arrow).

F4

Install fuel-injection pump

Volvo 240D, 740D + 760D-Turbo





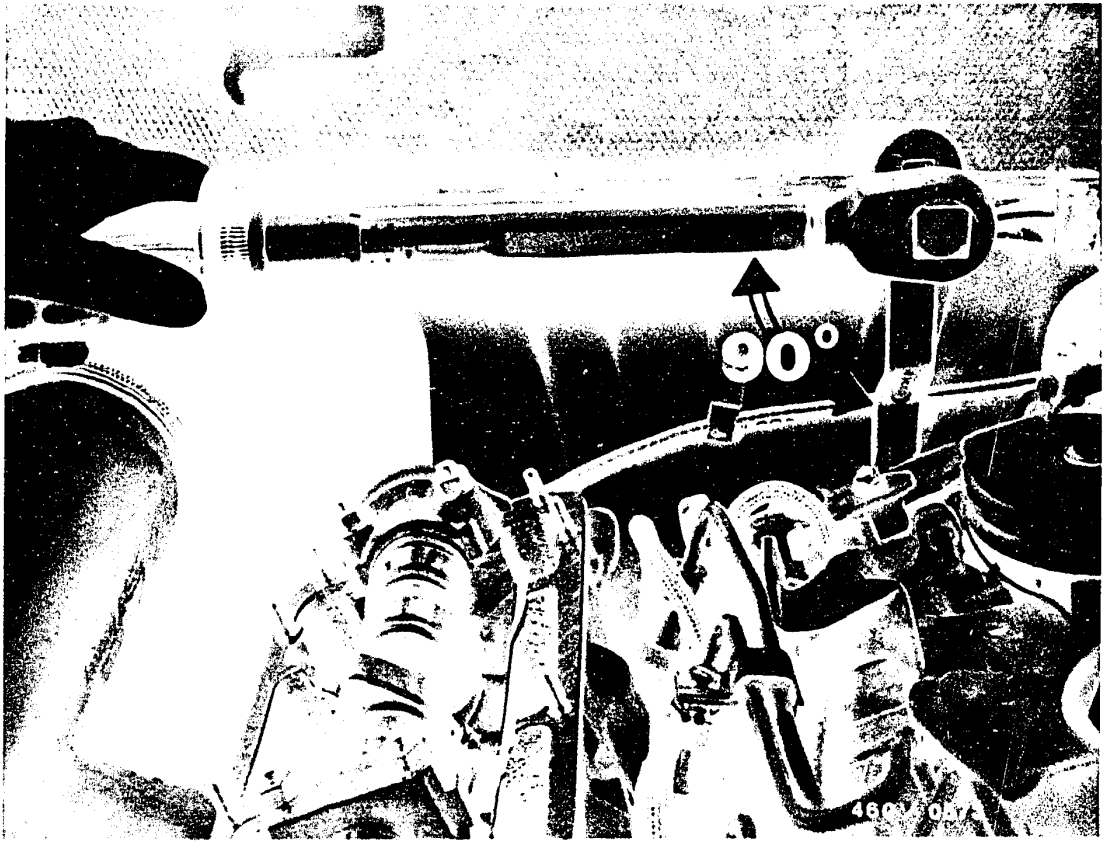
Mount injection-pump gear (insert Woodruff key in taper of pump drive shaft) and turn so that notch marks on injection-pump gear and bracket are in alignment (arrows).

Locate injection-pump gear with setting mandrel KDEP 1122.

F5

Install fuel-injection pump
Volvo 240D, 740D, + 760D-Turbo





Tighten injection-pump gear fastening nut to 45 Nm by means of box wrench KDEP 1120.

Note:

Insert the torque wrench into the box wrench so that box wrench and torque wrench are exactly at right angles to each other.

If this is not done, the tightening torque will be incorrect.

F6

Install fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





Remove setting rule KDEP 1117.

Mount cylinder head cover.

F7

Install fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





Mount toothed belt with engine camshaft gear.

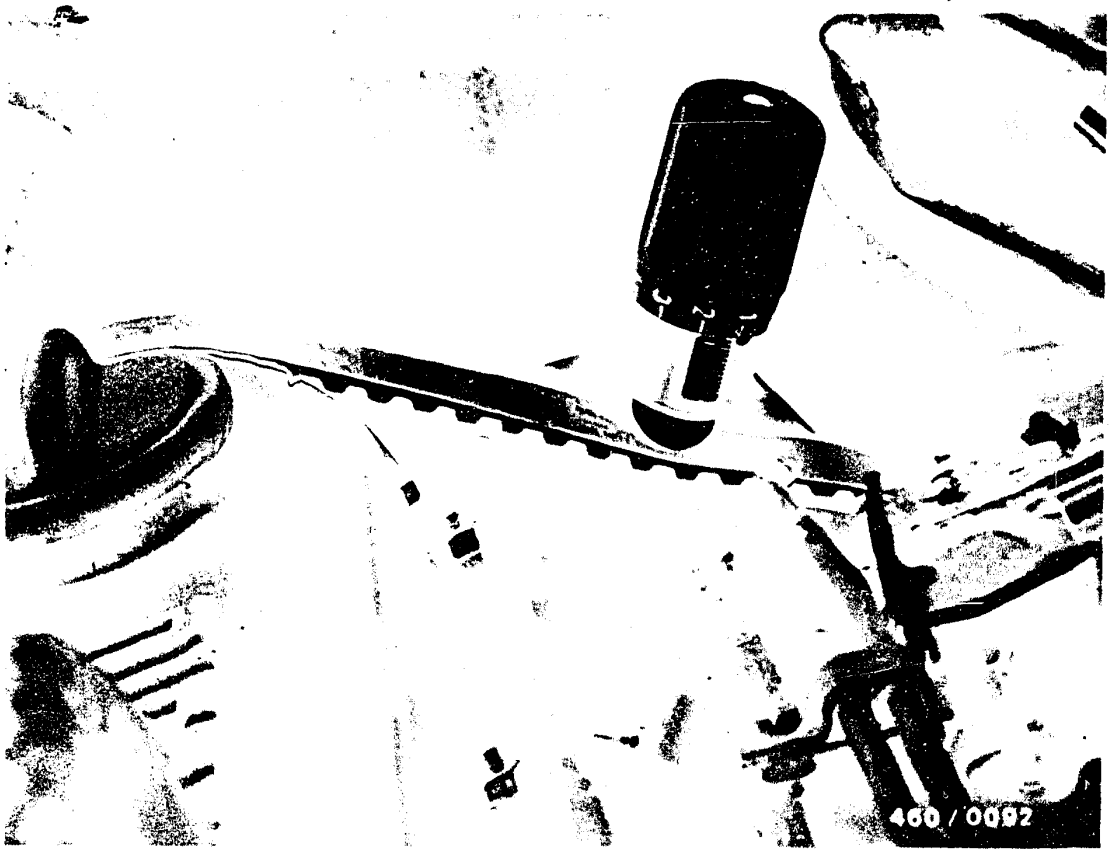
Tighten fastening screw for camshaft gear just enough so that the camshaft gear can still be moved by hand.

Remove setting mandrel KDEP 1122.

F8

Install fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





Test tension of toothed belt using belt tension tester KDEP 1121.

Mount belt tension tester as shown in the picture.

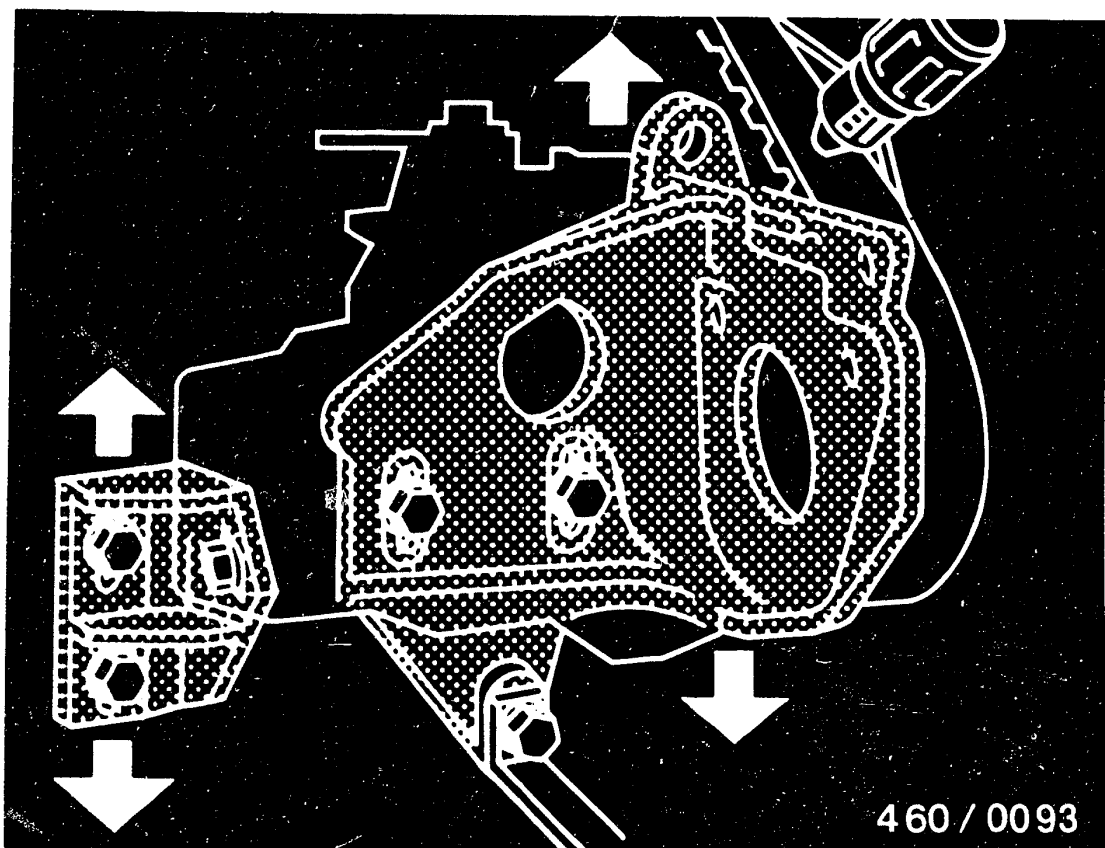
Turn vernier sleeve until bottom edge of sleeve aligns with the line mark on the measuring lug.

Make reading:

Checking value: 12...13

Setting value: 12.5



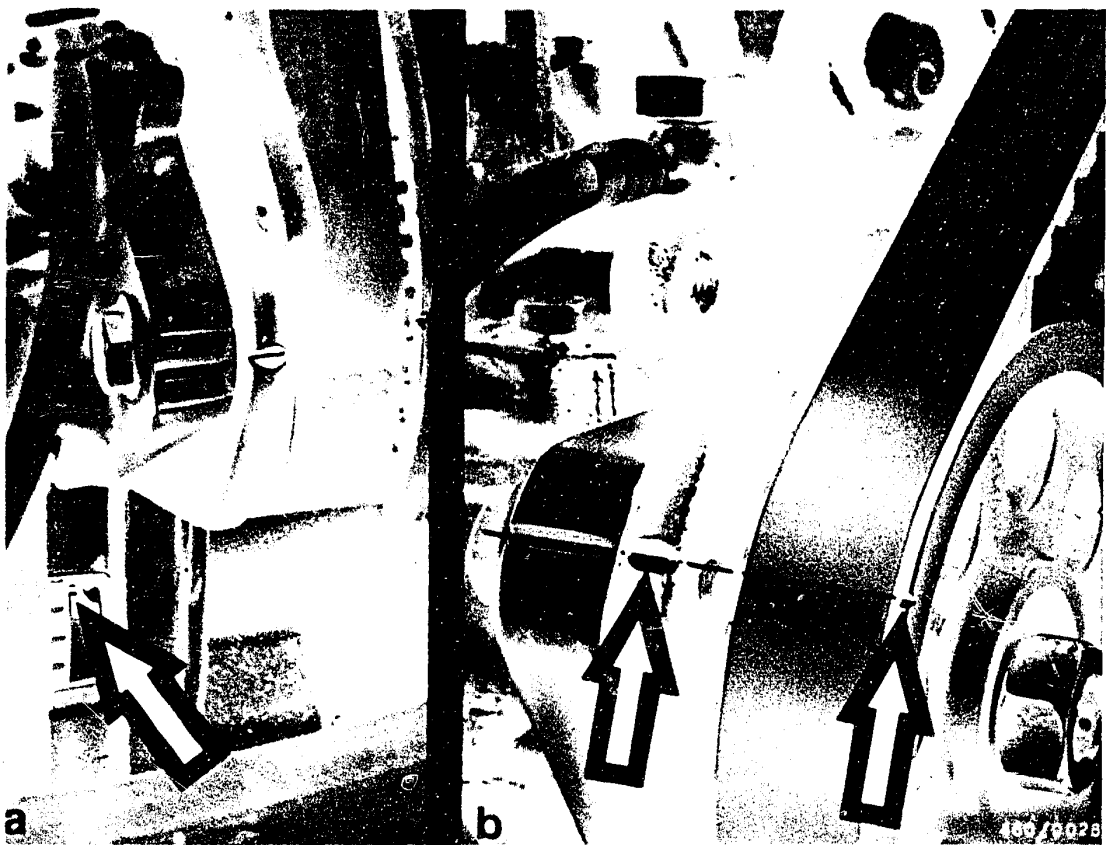


If the measured dimension differs from the set value, loosen fastening screws of pump bracket and of holding bracket on hydraulic head.

Move injection pump with bracket up or down as required (arrows).

Tighten fastening screws of pump bracket and of holding bracket to 65 Nm.

Turn engine crankshaft over twice and check tension of toothed belt again.



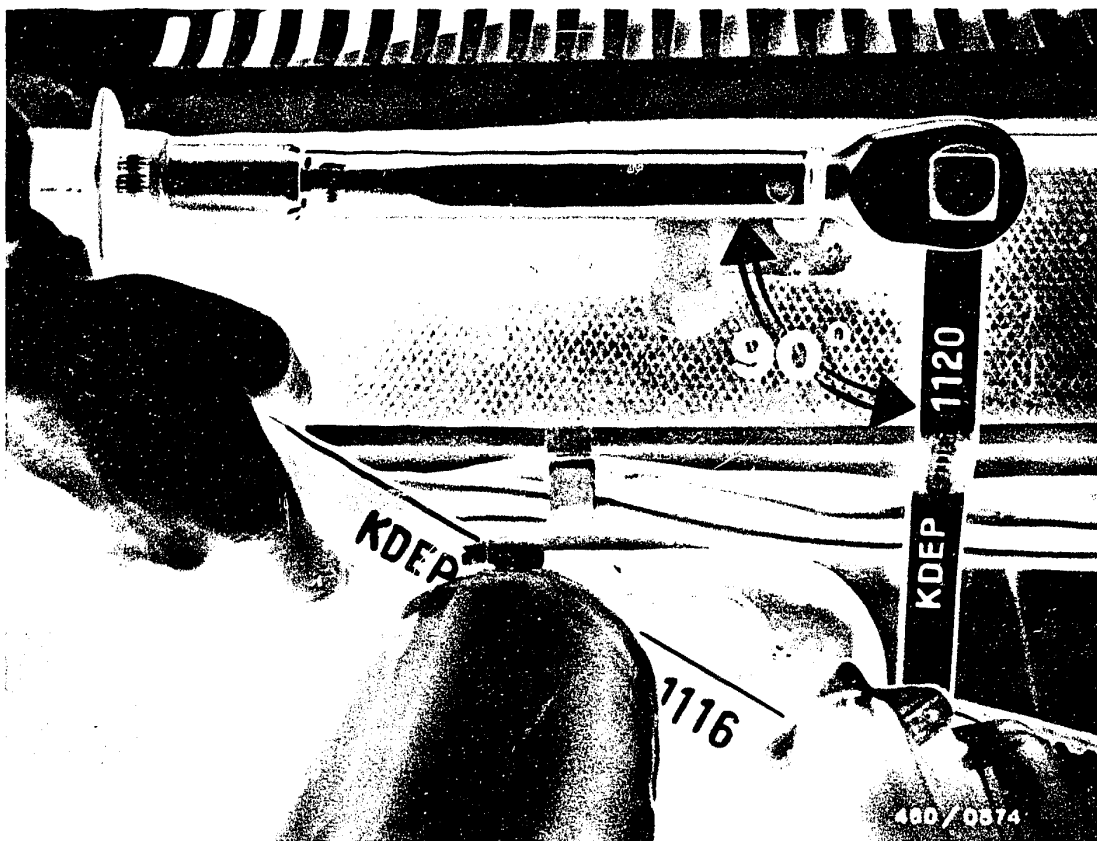
Check whether the mark between flywheel and clutch housing, as well as injection-pump gear and bracket aligns with reference mark.

Lock injection-pump gear using setting mandrel KDEP 1122.

F11

Install fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





Note:

For the following operation, make sure that the torque wrench is plugged onto the box wrench KDEP 1120 so that both wrenches are exactly at right angles (90°) to each other.

If this is not done, the tightening torque will be incorrect.

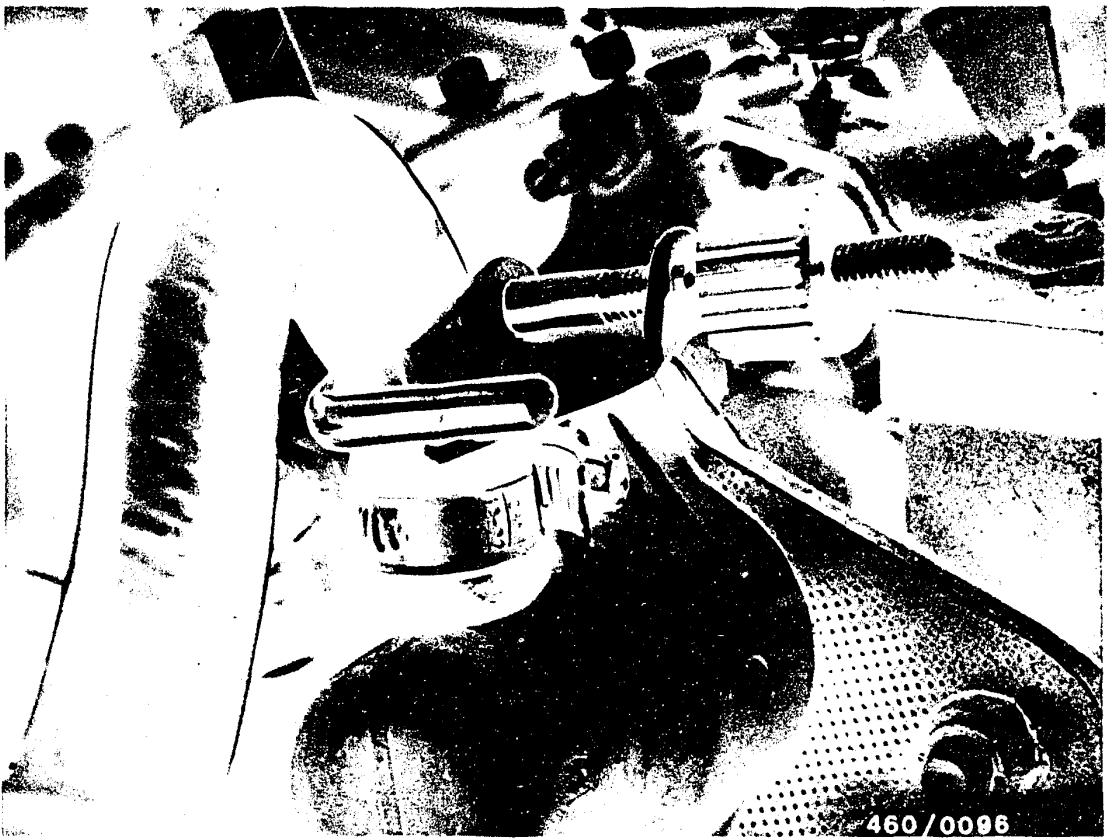
Lock camshaft gear with holder KDEP 1116 and tighten to 100 Nm by means of box wrench KDEP 1120.

Remove setting mandrel KDEP 1122.

F12

Install fuel-injection pump
Volvo 240D, 740D+ 760D-Turbo





Connect coolant lines to injection-pump control device and remove hose clampers.

Tighten hose clips.

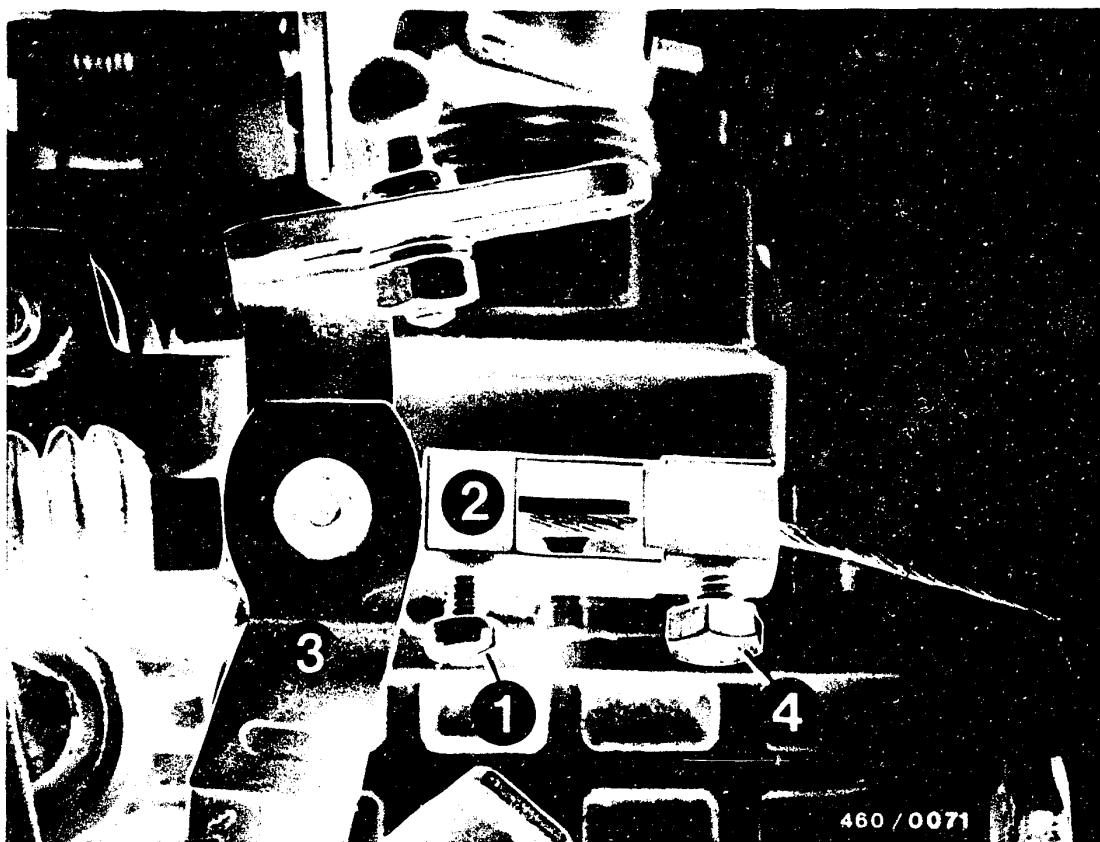
Install toothed-belt guard.

F13

Install fuel-injection pump

Volvo 240D, 740D + 760D-Turbo





When testing and adjusting the start of delivery, the temperature-controlled cold-start accelerator must be in the zero position.

Loosen clamping screw (1) on injection pump.

Pull intermediate piece (2) with control lever (3) towards hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft until control lever (3) is up against the stop bracket.

In this position, the control device is off.

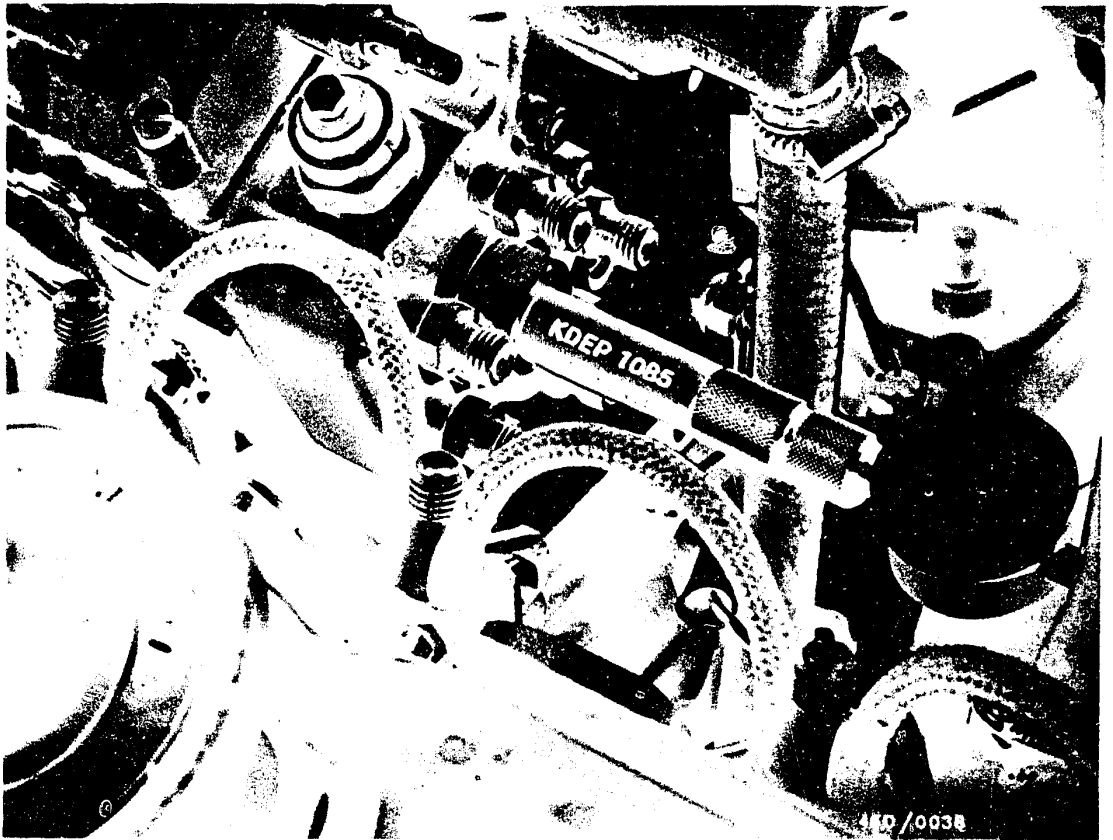
Caution!

Locating screw (4) must not be loosened, since, otherwise, it will be necessary to reset the control device.

F14

Install fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





Unscrew the bleeder screw from the center screw plug (triangular screw) of the hydraulic head.

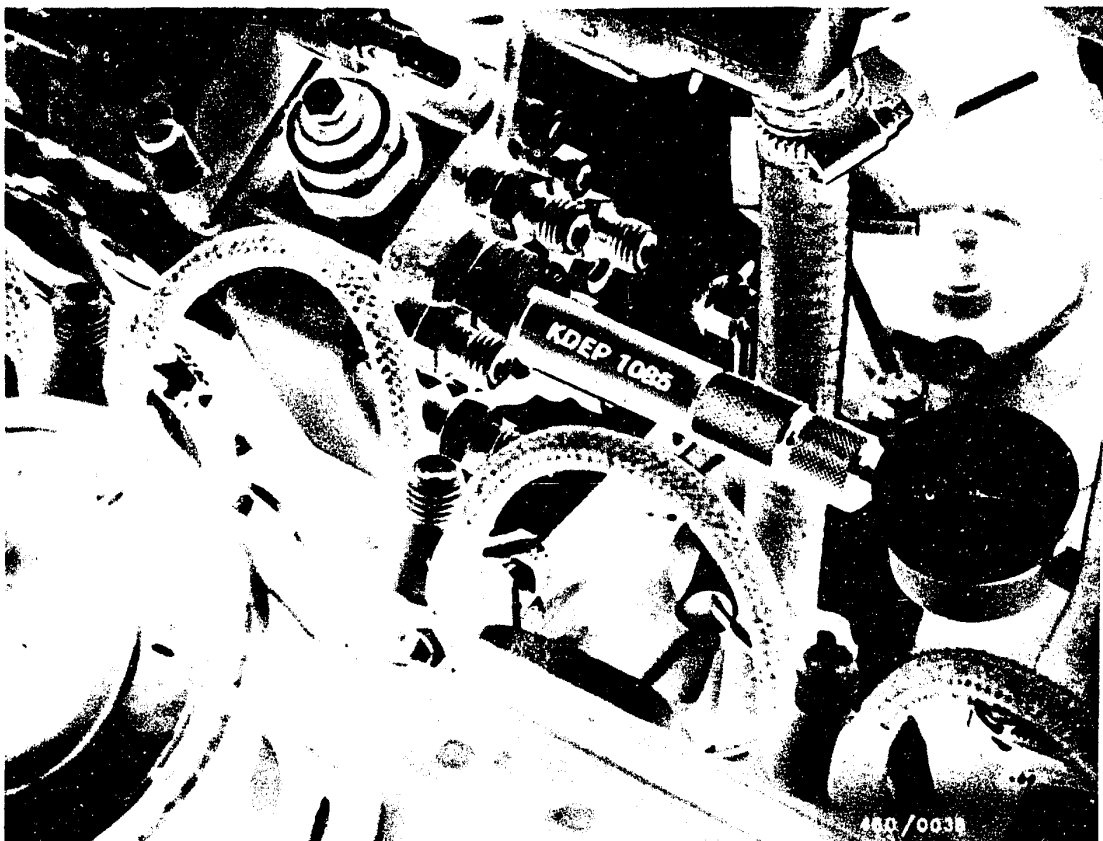
Mount tester KDEP 1085 and the dial indicator in the threaded hole.

Prestress the dial indicator approx. 2.5 mm.

Slowly turn the crankshaft counter to the direction of engine rotation until the needle on the dial indicator no longer moves.

Set the dial indicator at "0".





Turn crankshaft in engine direction of rotation until TDC mark on flywheel aligns with reference mark on clutch housing.

Check position of pump gear using setting mandrel KDEP 1122.

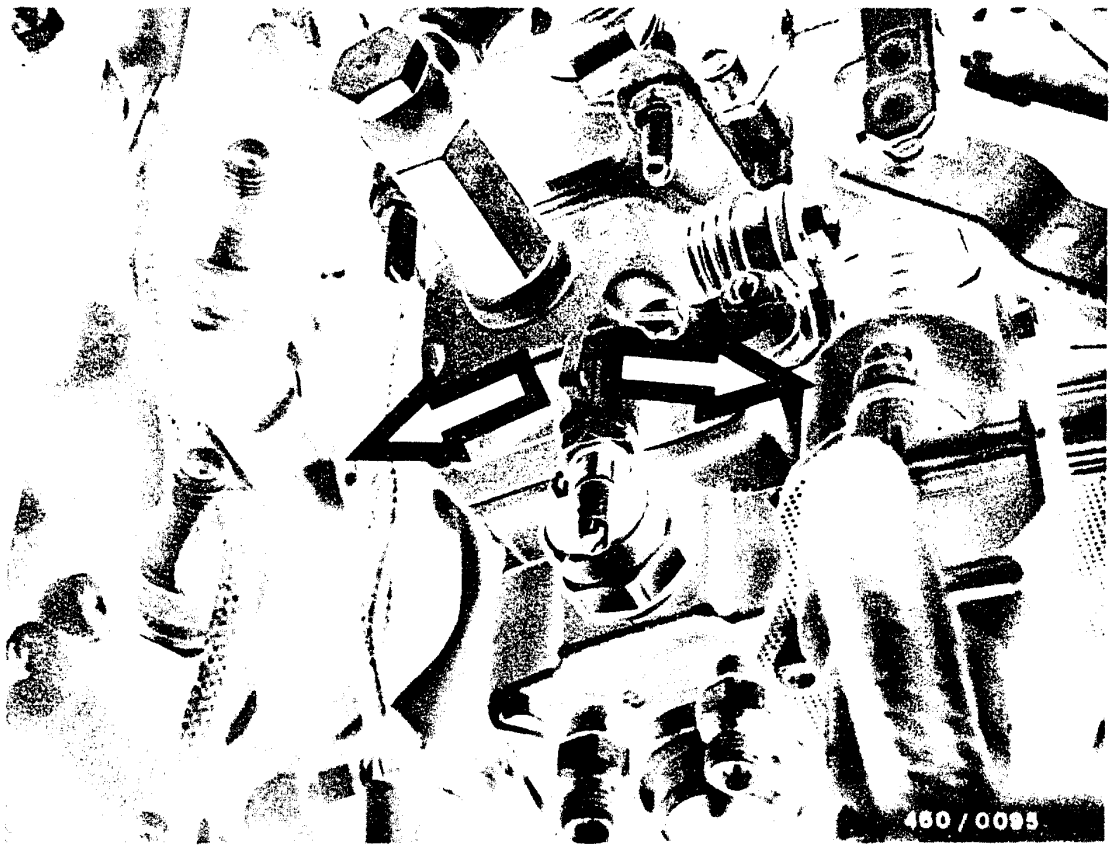
The dial indicator must show one of the following values as setting dimension:

Pump position 0.80 mm after BDC (engine D 20)

Pump position 0.70 mm after BDC (engine D 24)

Pump position 0.90 mm after BDC (engine D 24 Turbo)





If a correction is necessary, loosen injection-pump fastening screws and set the respective stroke by pivoting.

Setting values:

Pump position 0.80 mm after BDC (engine D 20)

Pump position 0.70 mm after BDC (engine D 24)

Pump position 0.90 mm after BDC (engine D 24 Turbo)

Tighten fastening screws to 25 Nm.

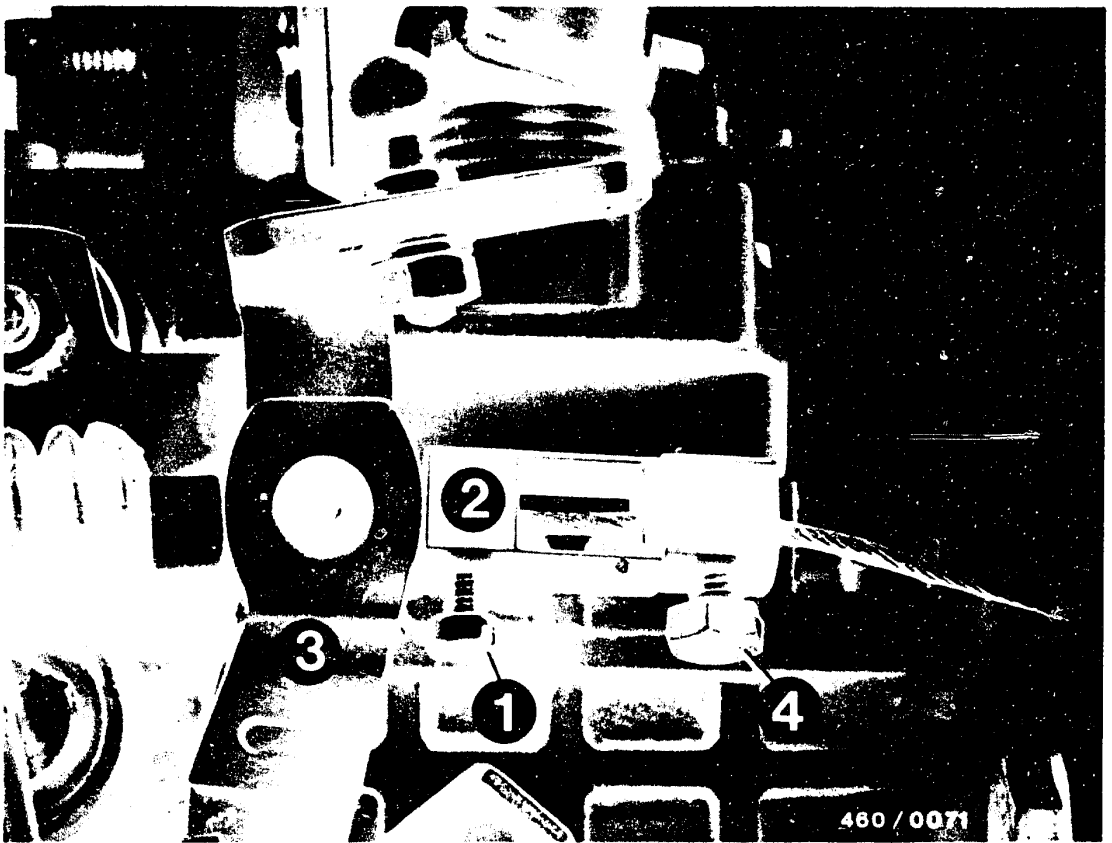
Turn crankshaft over twice and check setting.

Remove measuring tool KDEP 1085 with dial indicator.
Mount bleeder screw with new seal ring.

F17

Install fuel-injection pump
Volvo 240D, 740D + 760D-Turbo





Pull control lever (3) with intermediate piece (2) toward hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft.

Intermediate piece is in starting position.

Tighten clamping screw (1).





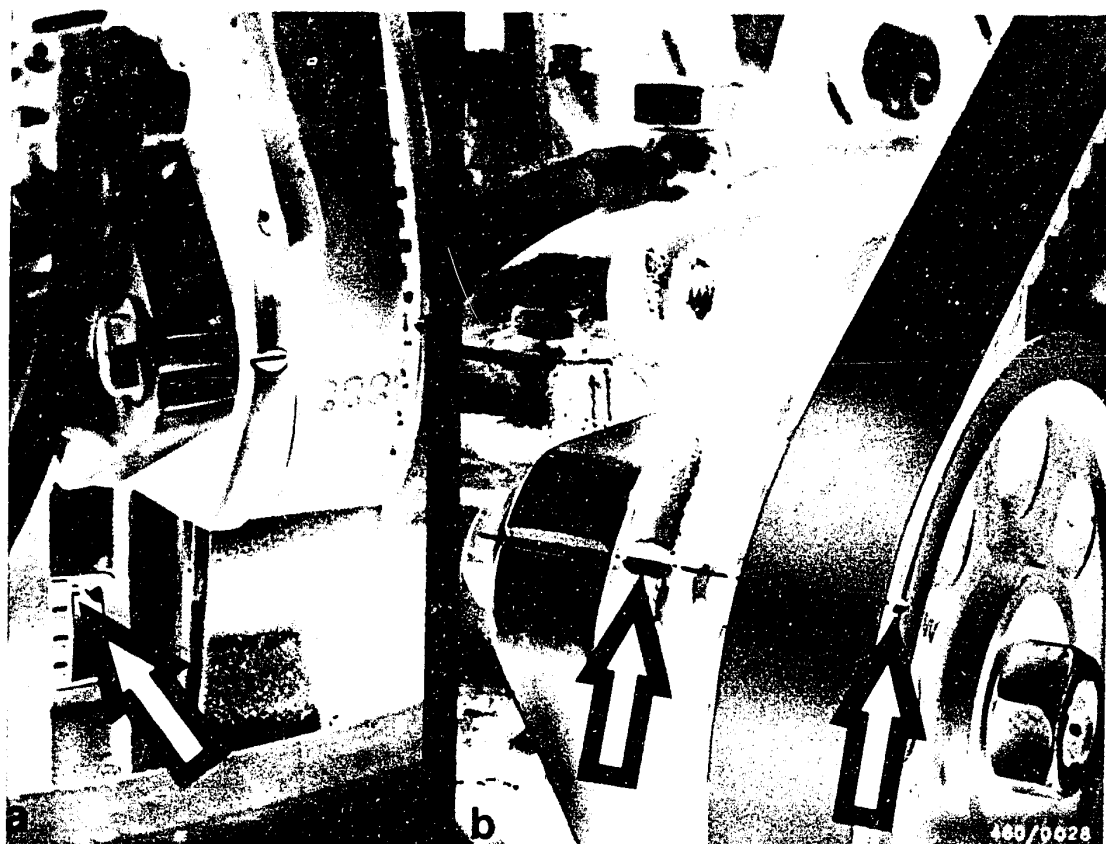
Tighten the fuel-injection lines using an open box wrench KDEP 1115 (prevent turning of the pressure valve holders by holding them with the wrench).

F19

Install fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





Mount vacuum pump with pump ram.

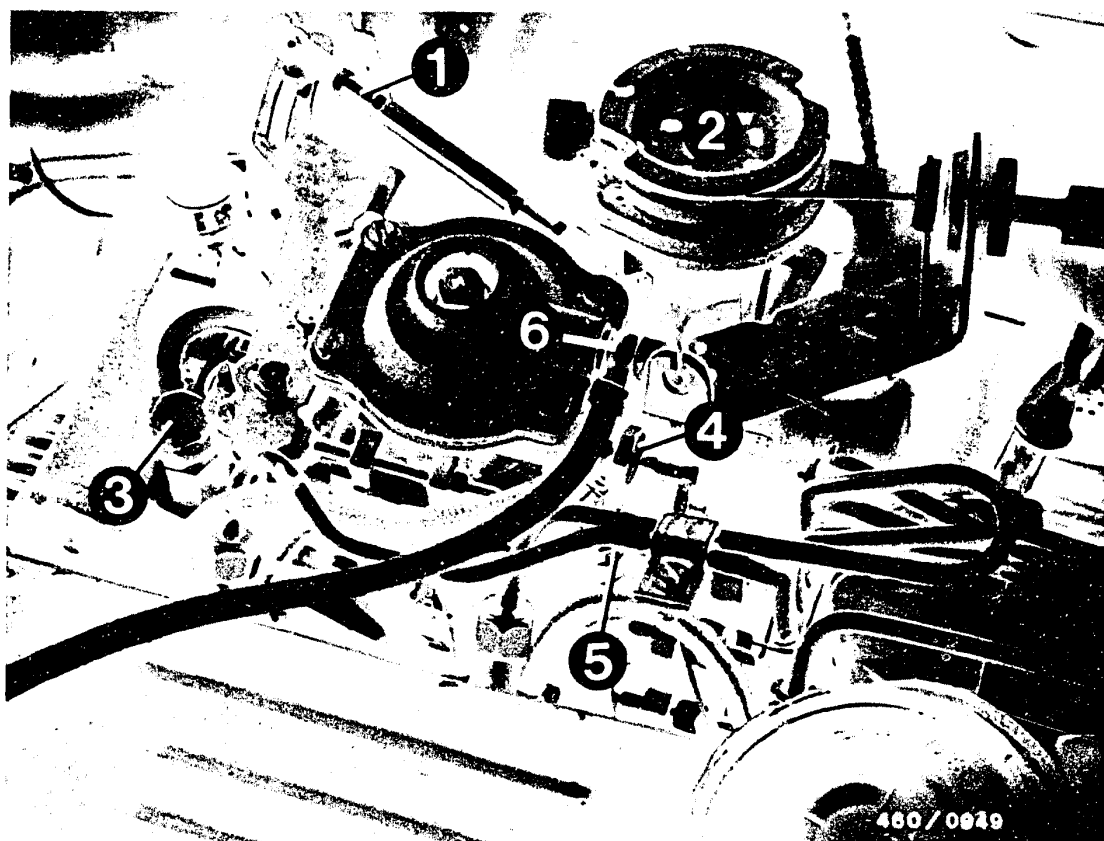
To do this, turn crankshaft to TDC on cylinder 1.

Marks on flywheel/clutch housing (picture a) and on injection-pump gear/bracket (picture b) must align.

Note:

Check O-ring seal; replace if necessary.





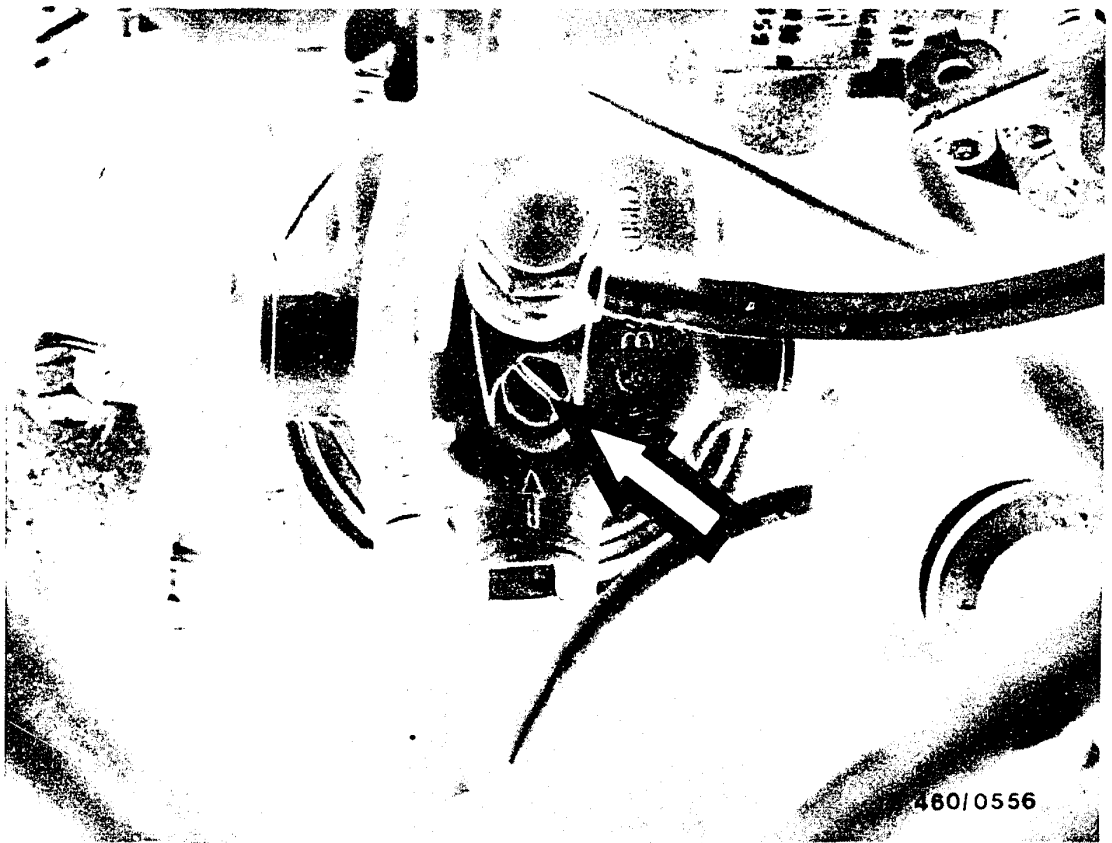
Put on the connector between the guide roller and the control lever (1), the guide roller with the holder for the cable (2), the fuel inlet line (3), the return line (4), the lead for the electric shutoff device (5) and the charge-air connection (6).

Note:

Do not mistake the inlet-union screws for the fuel inlet and return lines one for the other. The inlet-union screw for the return has throttle holes and is identified on the screw head with the word "OUT".

Connect negative cable to battery.

If applicable, connect vacuum hose to control box of cruise control.



Bleed fuel system

Fill fuel filter and injection pump with diesel fuel.

Tighten hose connections on filter cover.

If fitted, close bleeder screw on fuel filter (arrow).



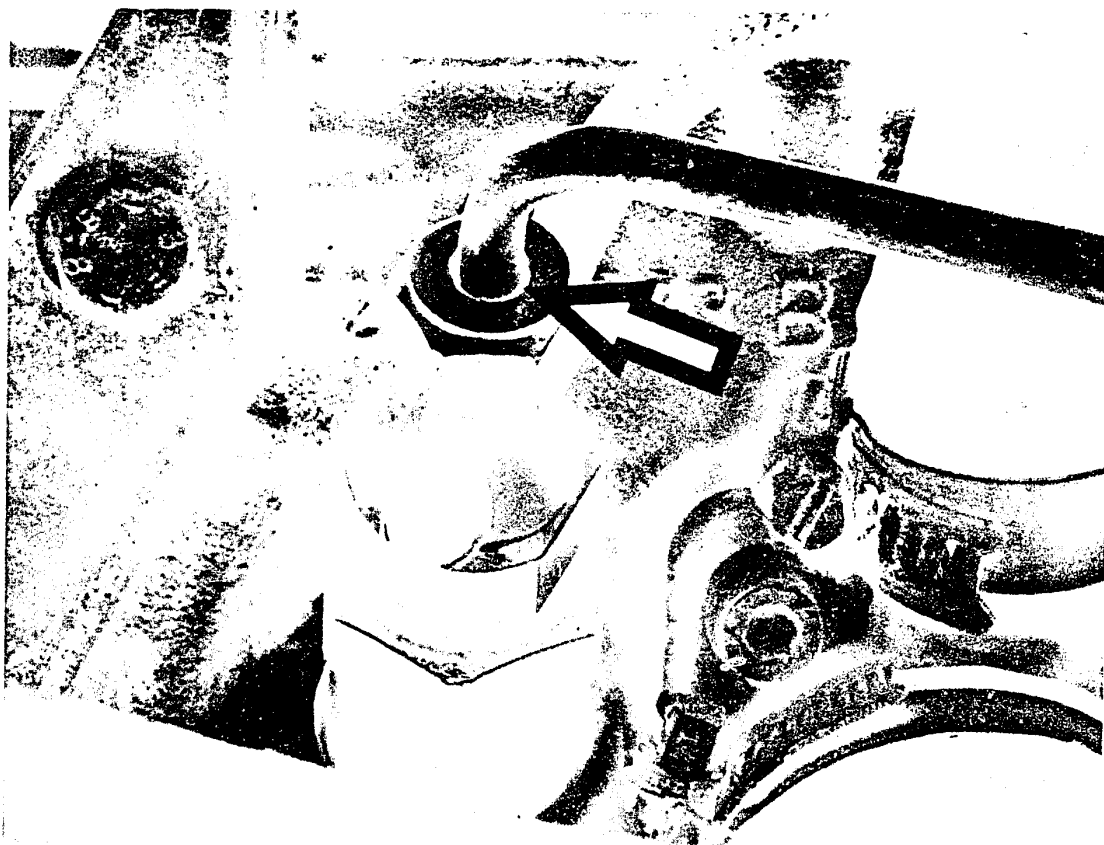


Loosen bleeder screw on injection pump and unscrew by a few turns (arrow).

Loosen union nuts of fuel-injection tubing on nozzle holders.

Operate starting motor without preheating.
When the fuel escaping from the bleed hole on the injection pump is free of bubbles, retighten the bleeder screw.





Continue to operate starting motor until fuel escapes from union nuts of nozzle holders (arrow).

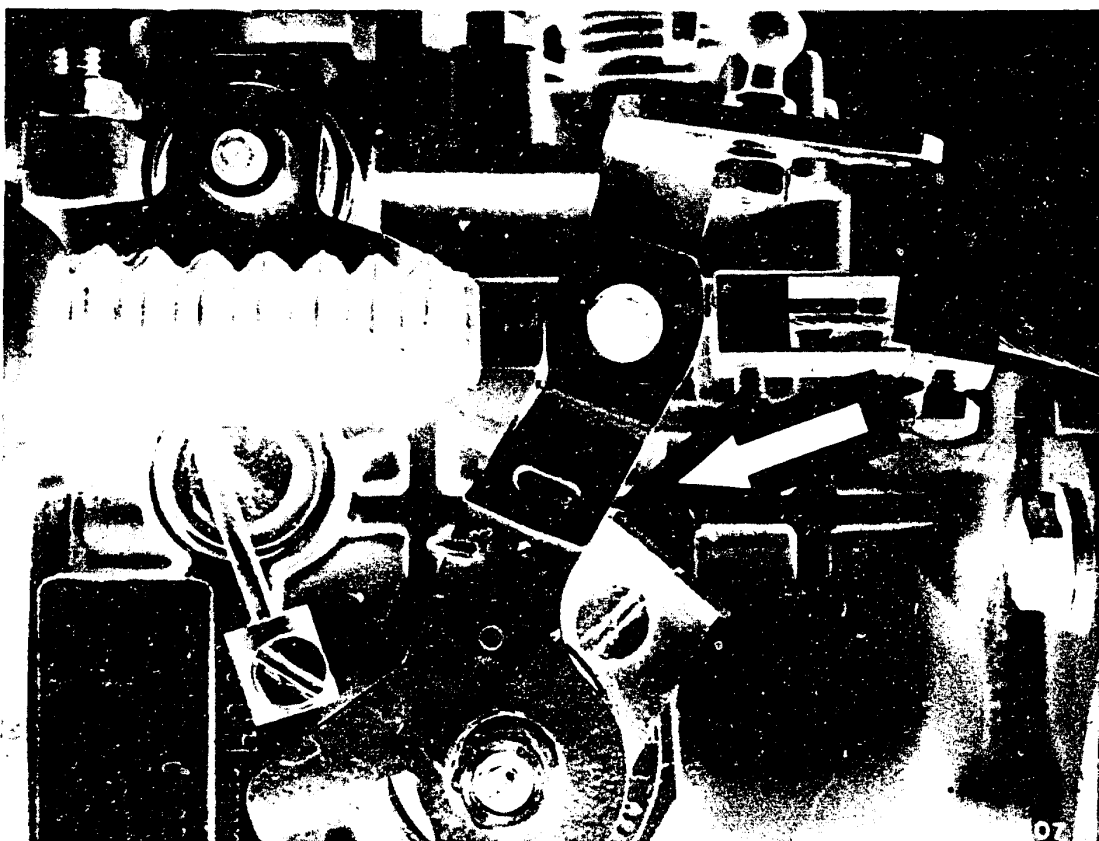
Tighten union nuts and operate starting motor until engine starts.

F24

Install fuel-injection pump

Volvo 240D, 740D + 760D-Turbo





Idle speed adjustment

Connect the tachometer (e.g. photoelectrically) to the engine.

Start the engine and run it at idle speed.

Note:

For adjustment of the idle speed, the engine must be at normal operating temperature.

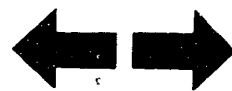
The control lever of the cold-starting accelerator must be against the stop bracket (arrow).

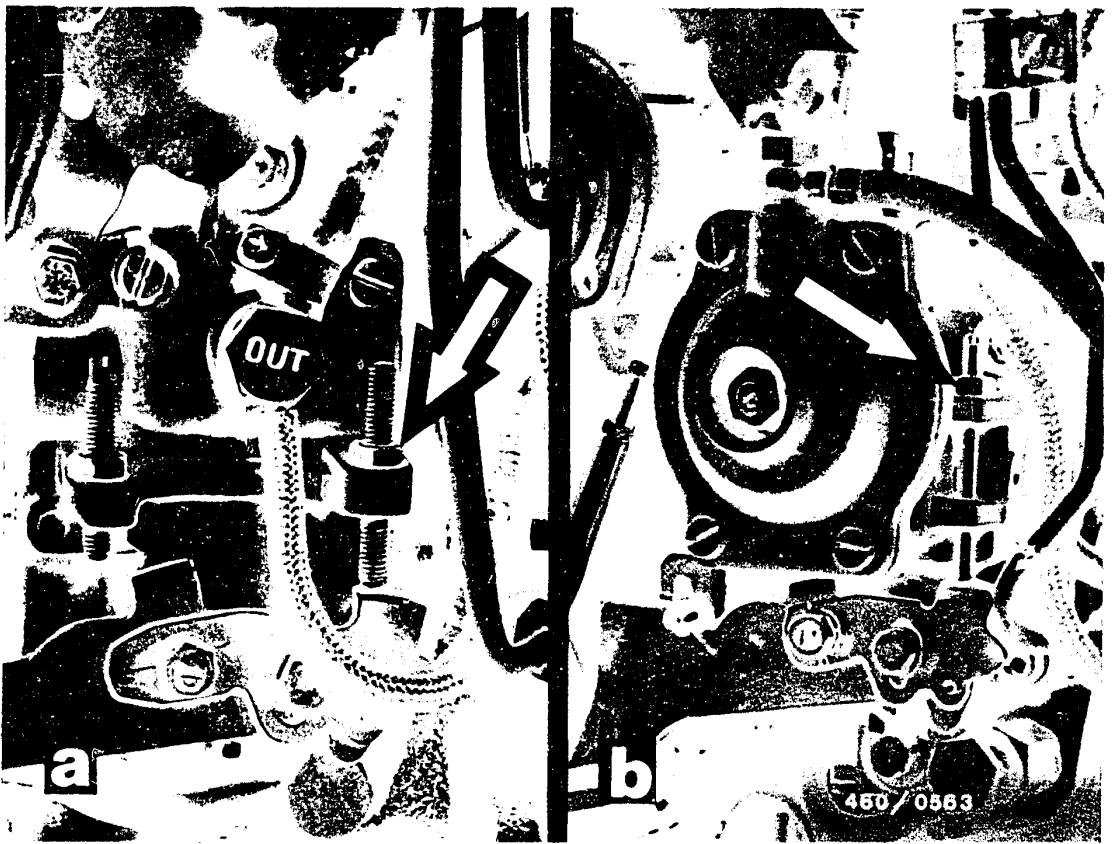
Cooling water temperature $+80^{\circ}\text{C}$.

G1

Install fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





Picture a = Naturally aspirated engine (D 20, D 24)

Picture b = Turbocharged engine (D 24 T)

Adjust engine speed at idle-adjusting screw (arrow) to:

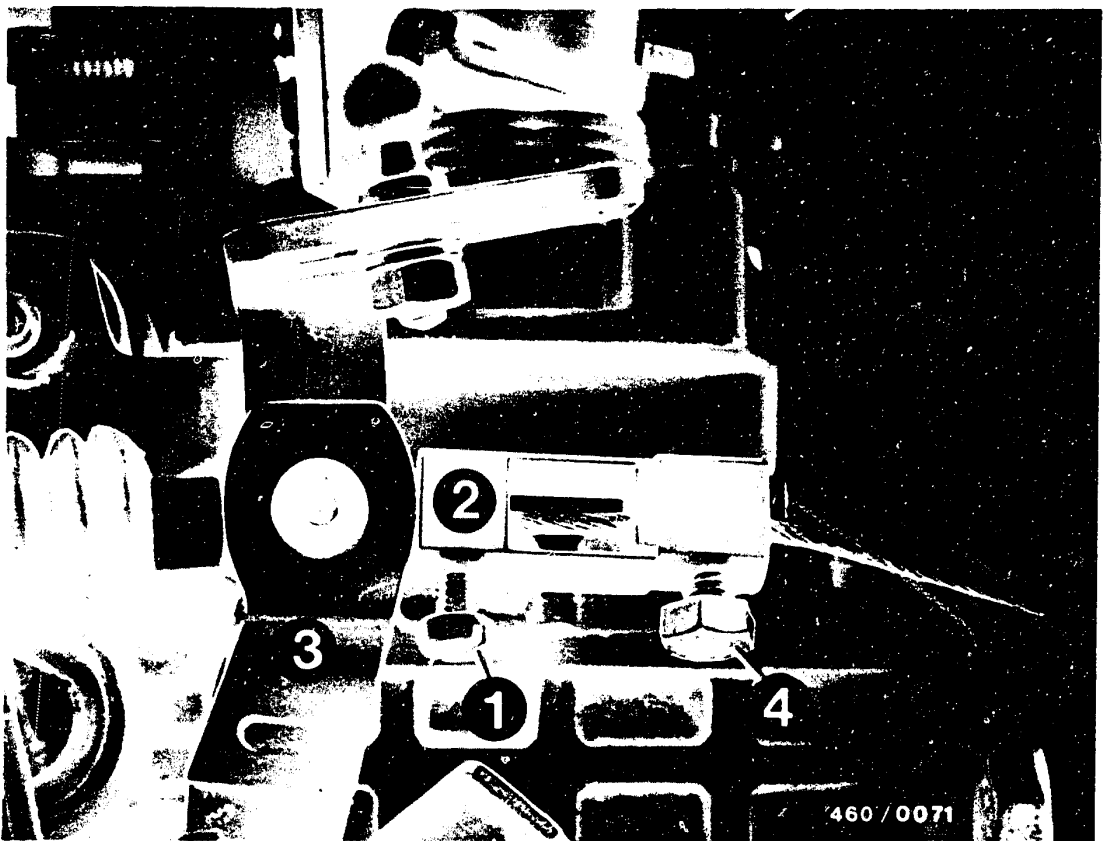
D20, D 24	$750 \pm 50 \text{ min}^{-1}$
D24 T - 1984	$750 \pm 50 \text{ min}^{-1}$
D24 T 1985-	$830 \pm 50 \text{ min}^{-1}$

Adjust engine speed to $750 \pm 50 \text{ min}^{-1}$ at the idle-speed adjusting screw (arrow).

Note that the camshaft and the injection pump are driven at half the engine speed.

After adjusting, lock and seal the adjusting screw.





Adjust accelerator cable

With the engine cold, before adjusting the accelerator cable, the cold-start accelerator (KSB) must be in the zero position.

To do this, loosen clamping screw (1) on injection pump.

Pull intermediate piece (2) with control lever (3) in direction of hydraulic head.

Turn intermediate piece (2) through 90° and slide again in direction of drive shaft until control lever (3) is up against stop bracket.

In this position, the control device is off.

Caution!

Screw (4) must not be loosened.

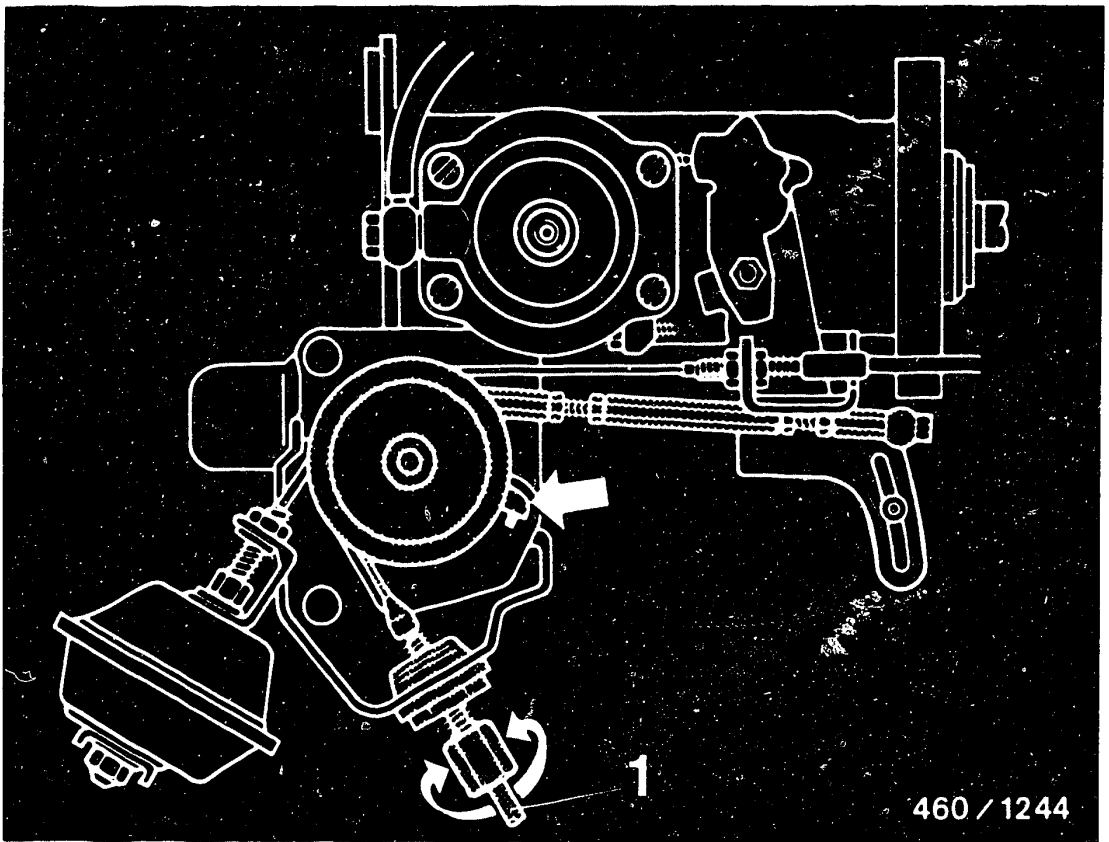
Otherwise, it will be necessary to reset the control device.

G3

Install fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





Adjust cable sleeve (1) so that the cable is taut, but the deflector roller does not lift off the stop (arrow).

Note:

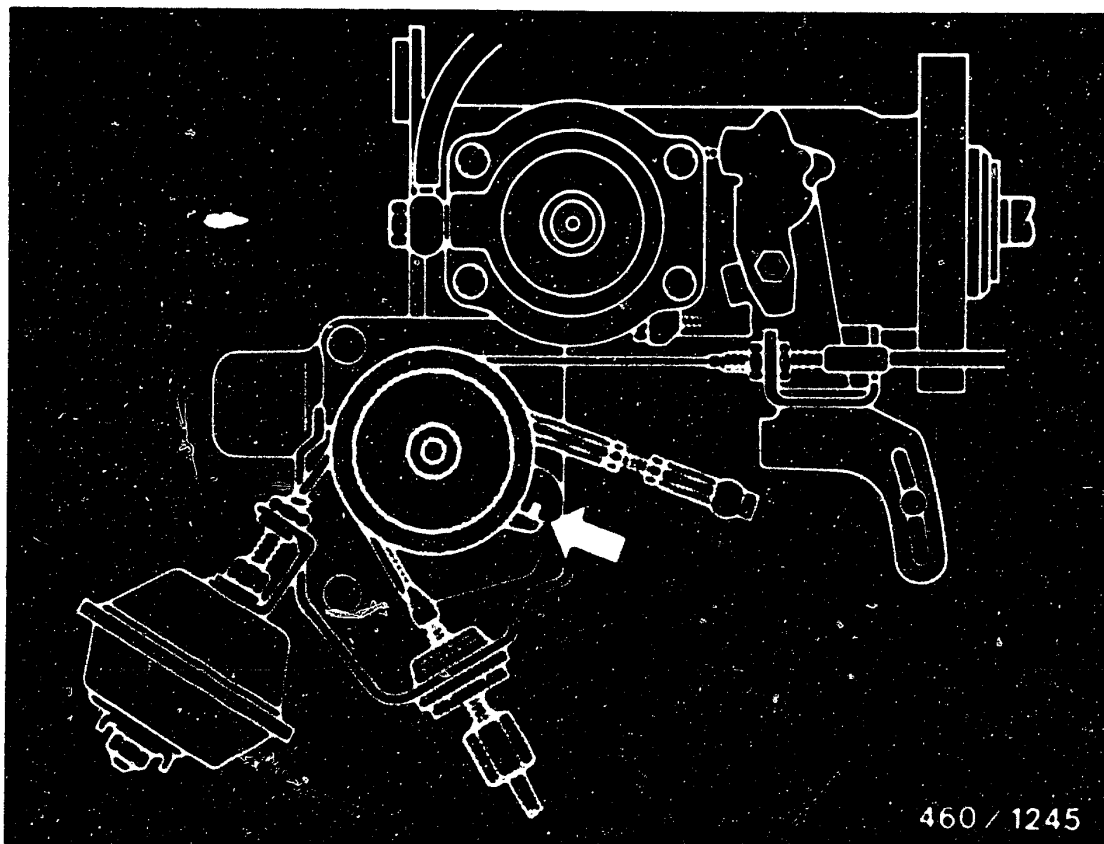
The connection to the injection-pump control lever is unhooked while doing this.

G4

Install fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





460 / 1245

Test full-throttle adjustment

Fully depress accelerator.

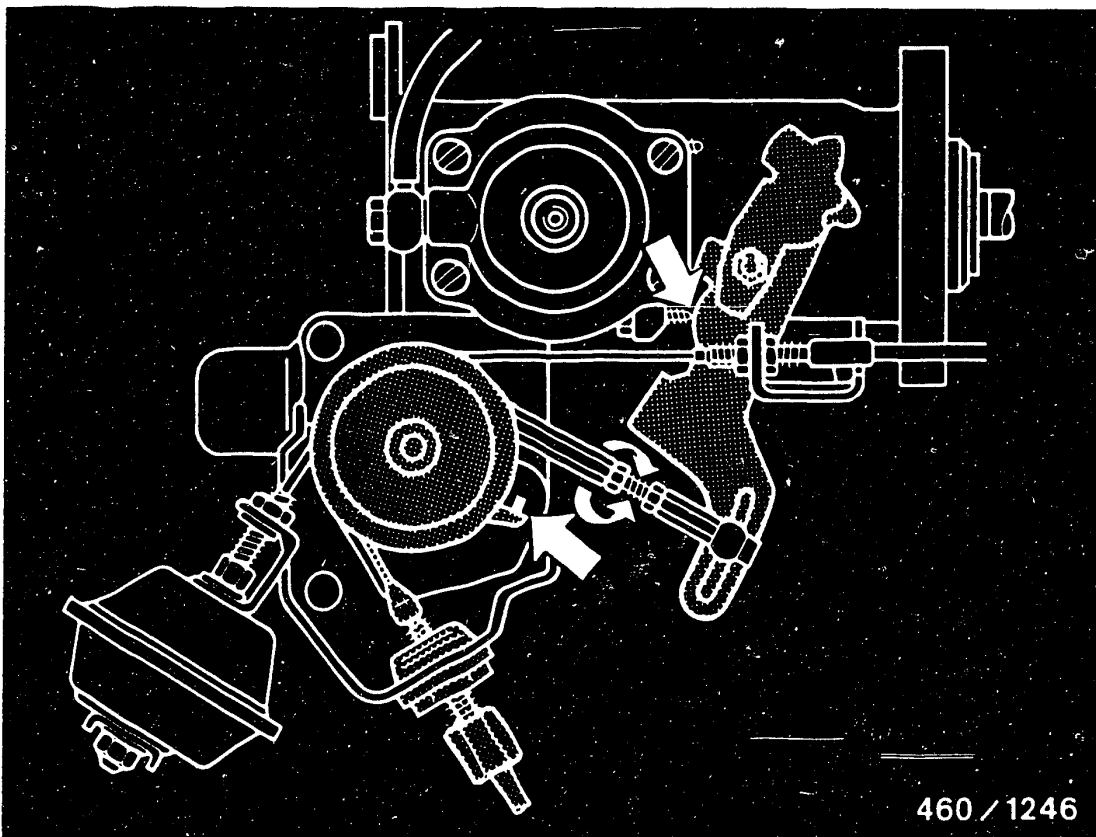
The deflector roller must come up against the limit stop (arrow).

If necessary, correct cable adjustment.

G5

Install fuel-injection pump
Volvo 240D, 740D, + 760D-Turbo





Adjust full-throttle adjustment at throttle linkage

Hook connection piece into injection-pump control lever.

Bring deflector roller up against limit stop.

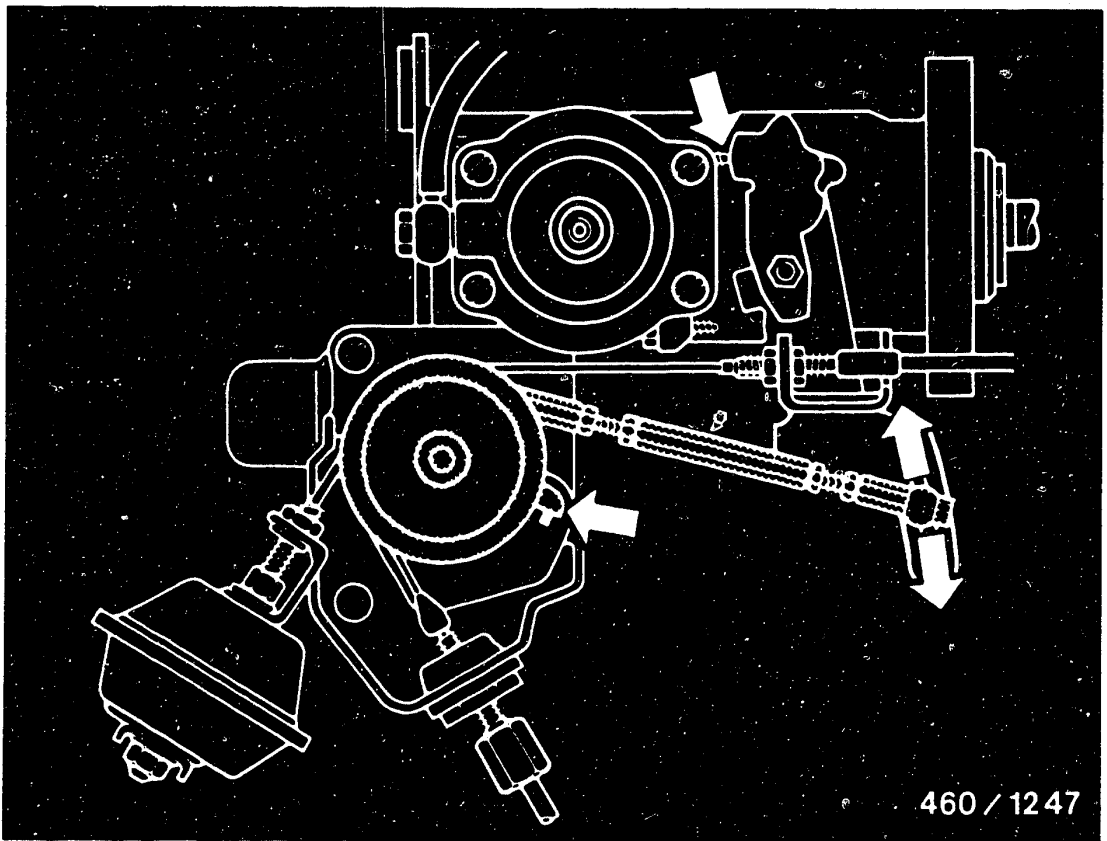
Adjust connecting linkage to injection-pump control lever so that the control lever is up against the maximum-speed stop.

G6

Install fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





460 / 1247

Adjust low idle speed

Bring deflector roller up against idle stop.

Injection-pump control lever must be up against the idle-stop screw of the injection pump.

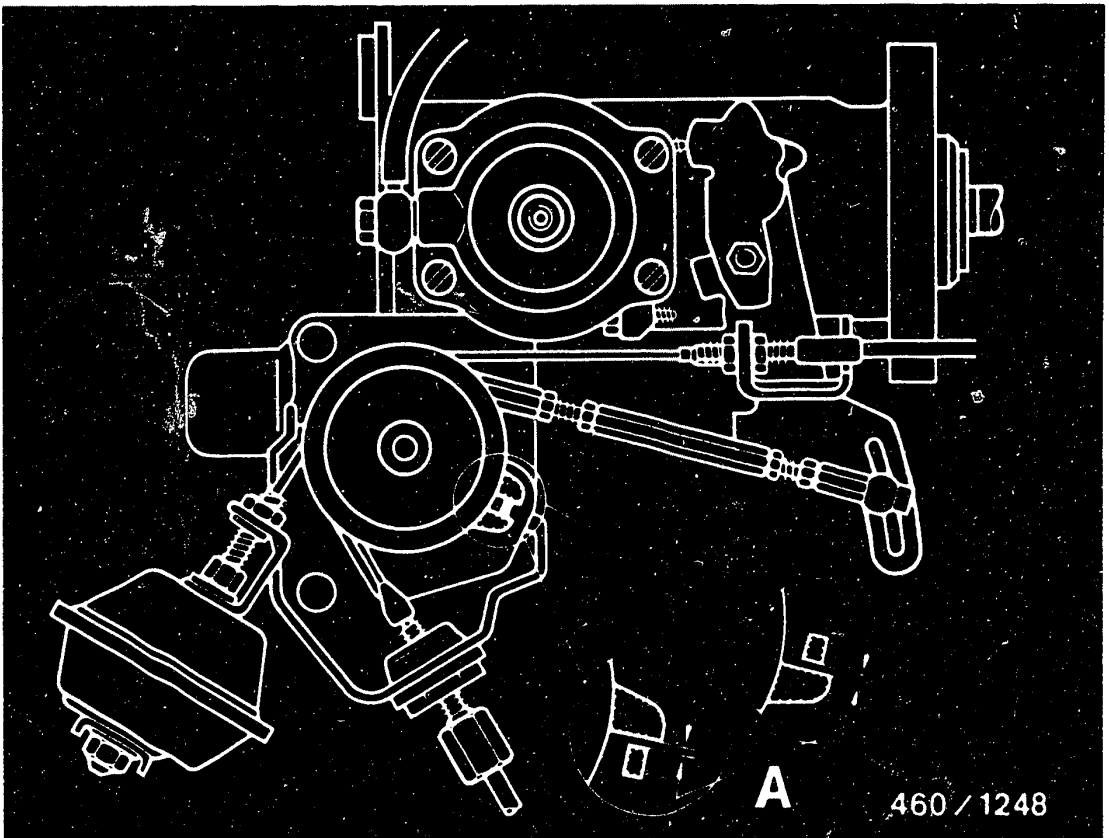
Correct by changing the position of the ball joint.

After this correction, the setting of the maximum-speed stop must be checked (two-way correction).

G7

Install fuel-injection pump
Volvo 240D, 740D, + 760D-Turbo





A = max. 0.3 mm

Fine adjustment at throttle leakage

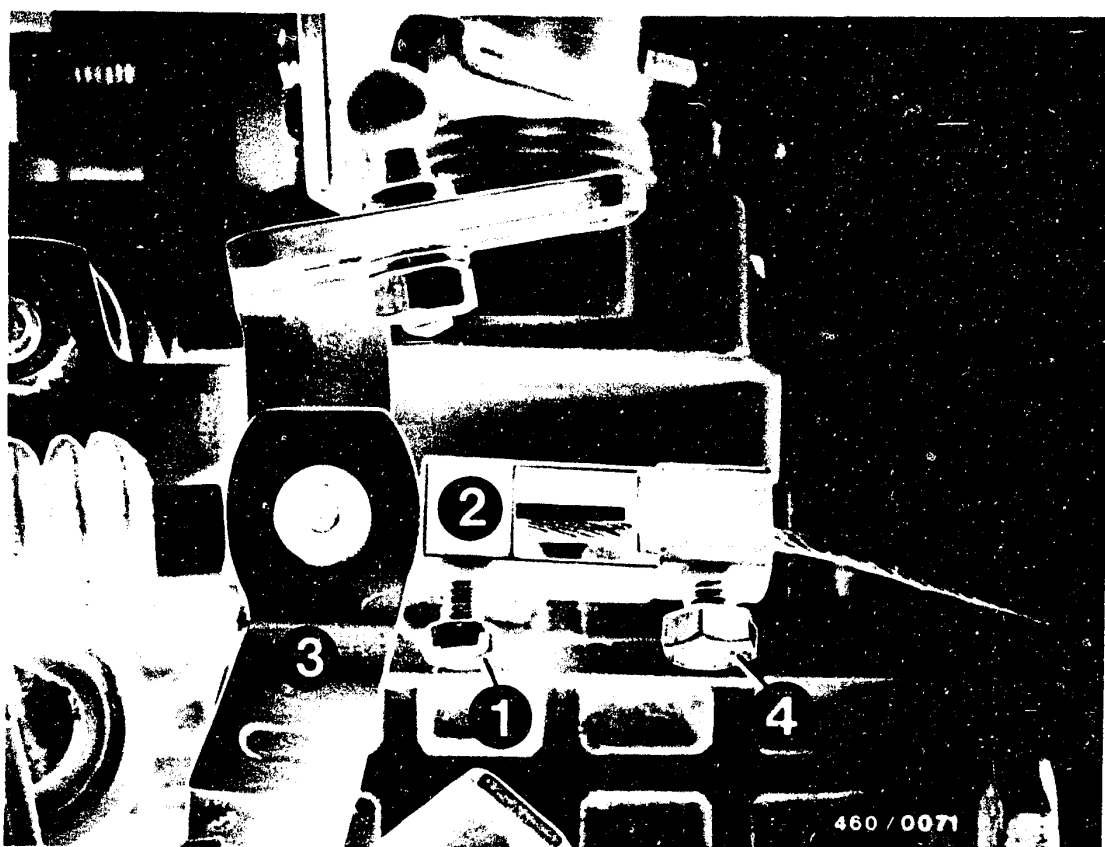
After the fine adjustment, check the play between the deflector roller and the stop on both sides.

The play must be no more than 0.3 mm.

G8

Install fuel-injection pump
Volvo 240D, 740D, + 760D-Turbo





Pull control lever (3) with intermediate piece (2) toward hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft.

The intermediate piece is in the starting position.

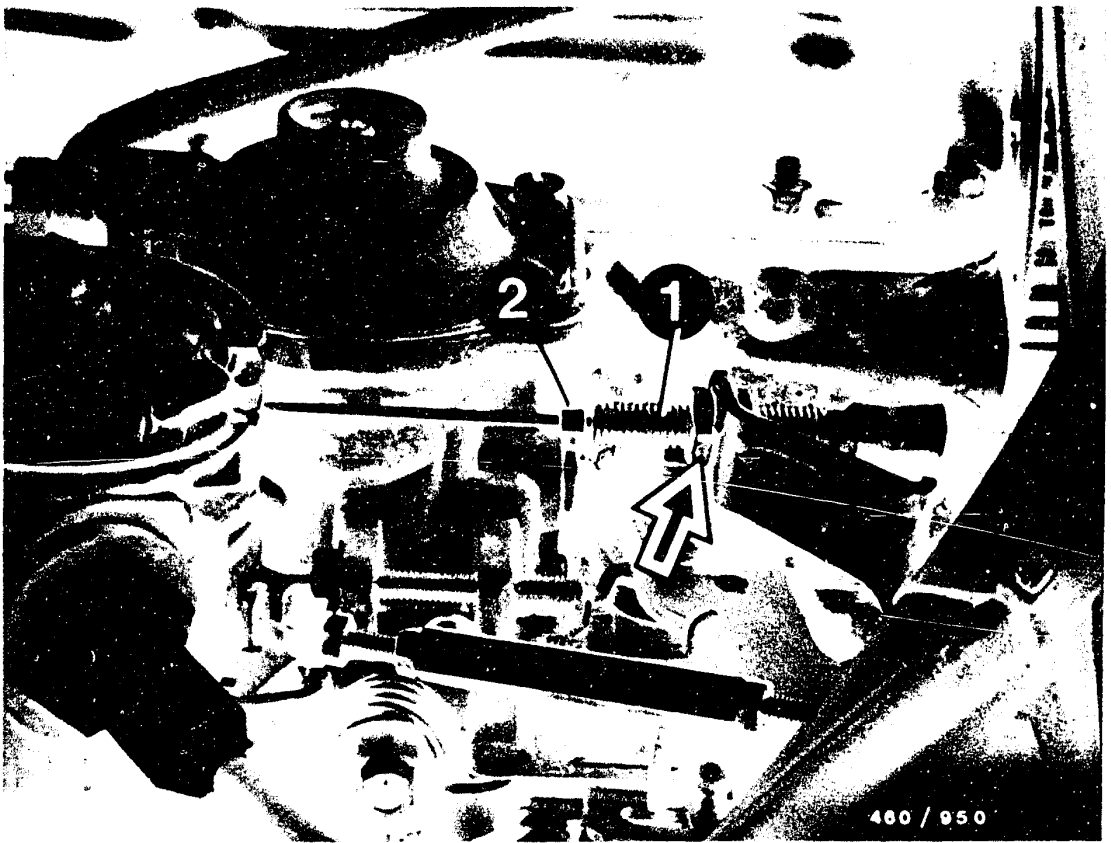
Tighten clamping screw (1).

G9

Install fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





Kick Down adjustment

Requirement:

- Engine at normal operating temperature, cooling water temperature $+80^{\circ}\text{C}$.

Adjustment made at idle.

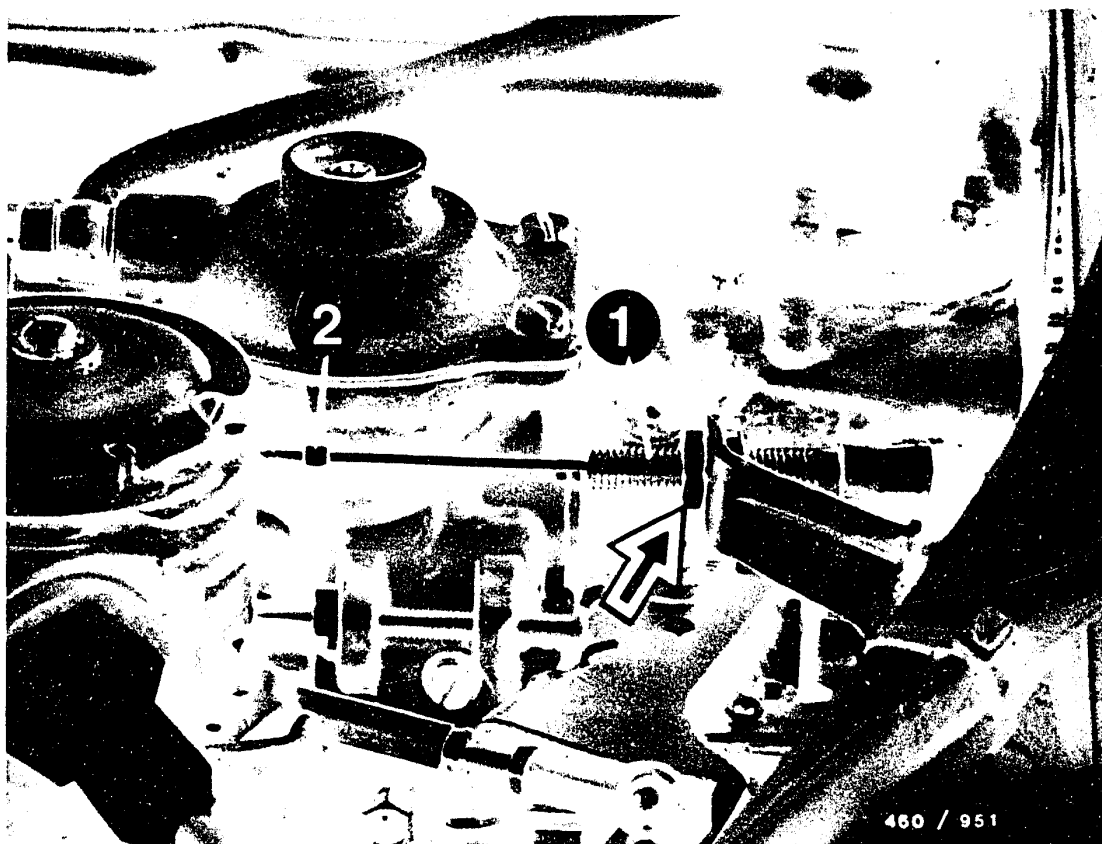
- Release the lock nut (arrow) and set the guide sleeve (1) at a distance from 0.25 ... 1.0 mm to the cable clamp (2).
- Tighten the lock nut and check the setting.

G10

Install fuel-injection pump

Volvo 240D, 740D, + 760D-Turbo





Adjusting the kick down point

- Push the accelerator pedal down to the Kick Down point.
- Release the lock nut (arrow) and set the guide sleeve (1) to a distance of

+ 1.6
51 - 0.6 mm

to the cable clamp (2).

- Tighten the lock nut, check the setting.

G11

Install fuel-injection pump
Volvo 240D, 740D, + 760D-Turbo





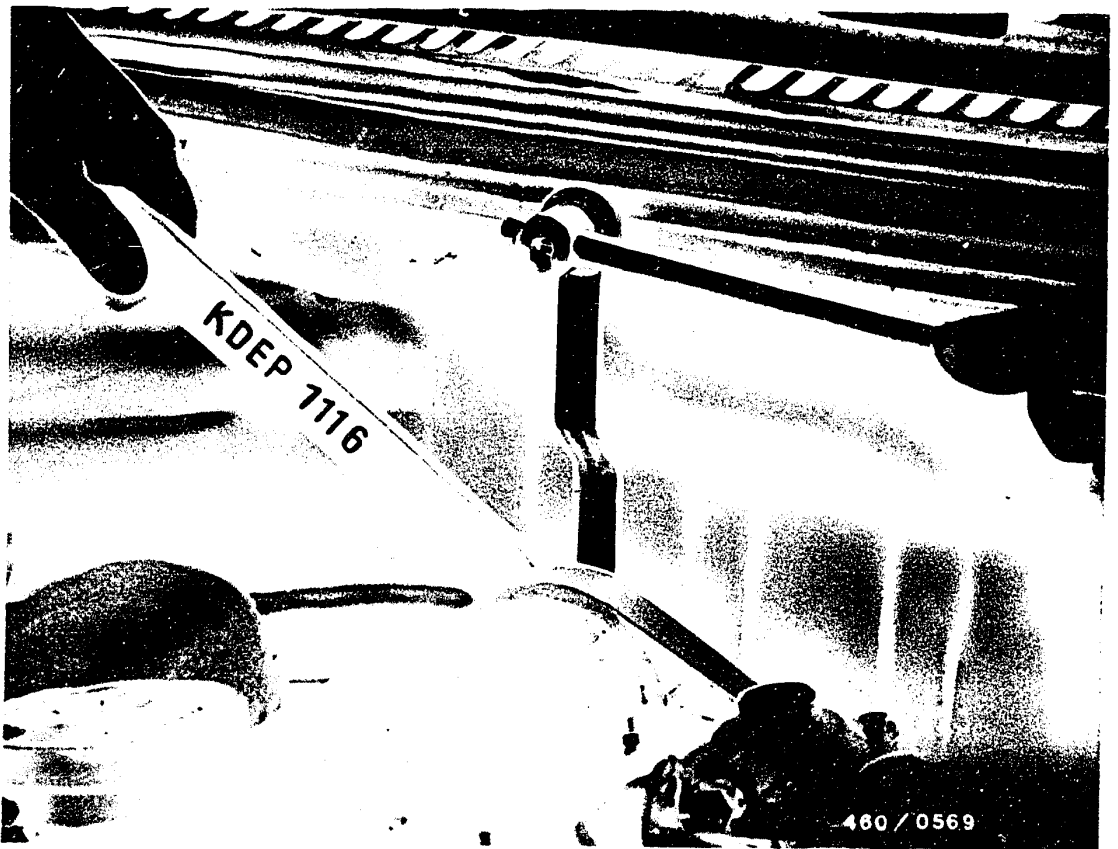
28. Checking and adjusting engine timing

28.1 Checking engine timing

- Remove the cylinder head cover and the protective cover of the toothed belt for the fuel-injection pump. Turn the crankshaft to the first cylinder TDC (the 6th cylinder is at valve overlap).

The marking on the flywheel and the reference marking on the coupling housing must align.





Lock injection-pump gear using setting mandrel KDEP 1122.

Lock camshaft gear with holder KDEP 1116.

Loosen camshaft gear fastening screw by means of box wrench KDEP 1120 and unscrew.

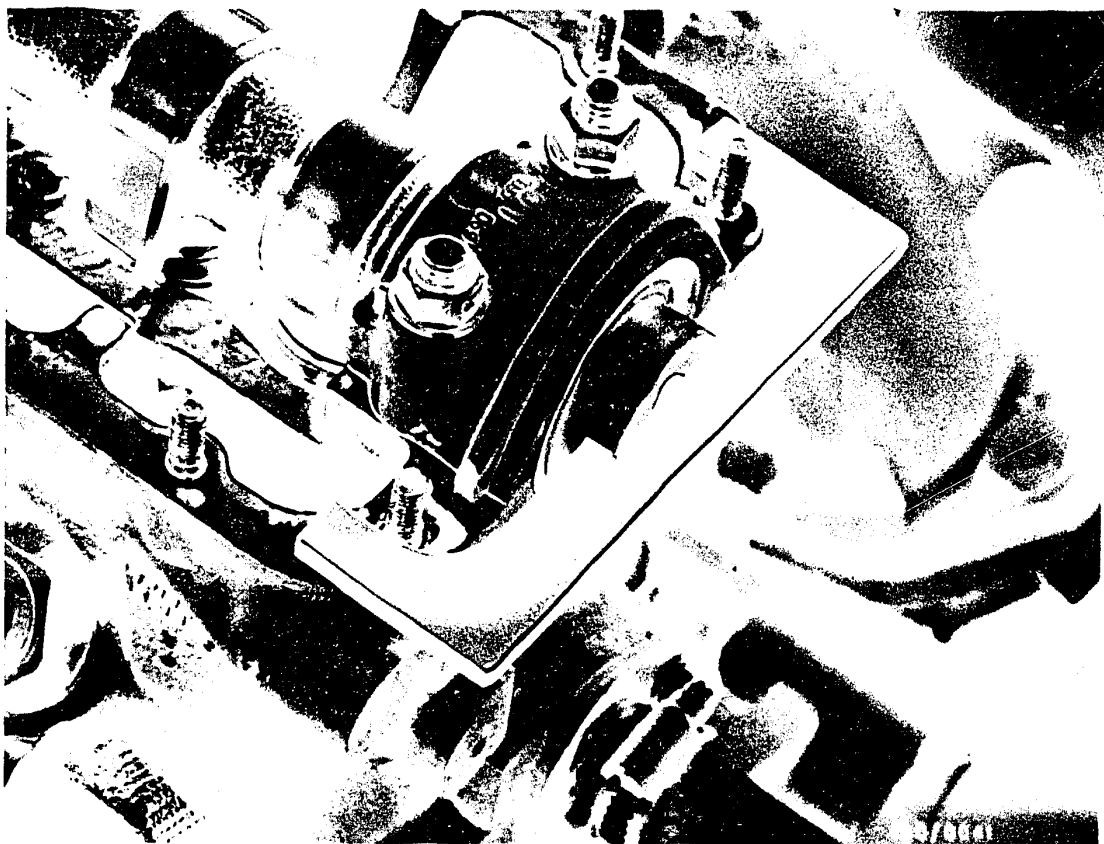
Remove camshaft gear with toothed belt from engine camshaft.

Check TDC position on flywheel.

G13

Test and adjust engine timing
Volvo 240D, 740D + 760D-Turbo





Slide setting rule KDEP 1117 into camshaft recess.

If setting rule cannot be introduced, the engine timing must be corrected.

G14

Test and adjust engine timing

Volvo 240D, 740D + 760D-Turbo

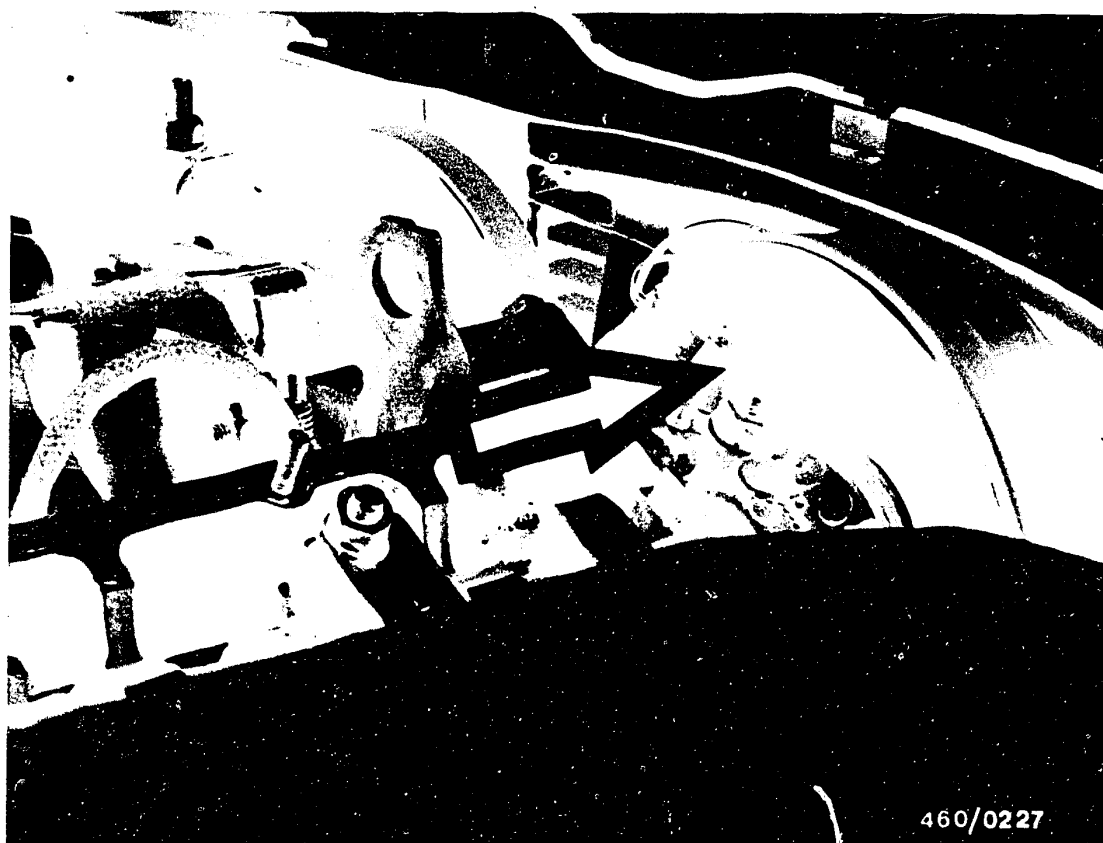




28.2 Adjust engine timing

Turn crankshaft until setting rule can be introduced, and then place a 0.2 mm thick feeler gauge under the left-hand leg of the rule (arrow).





460/0227

Remove toothed-belt cover for camshaft drive.

Loosen engine camshaft drive gear fastening screw by one turn.

Loosen camshaft drive gear from camshaft by tapping with a hammer.

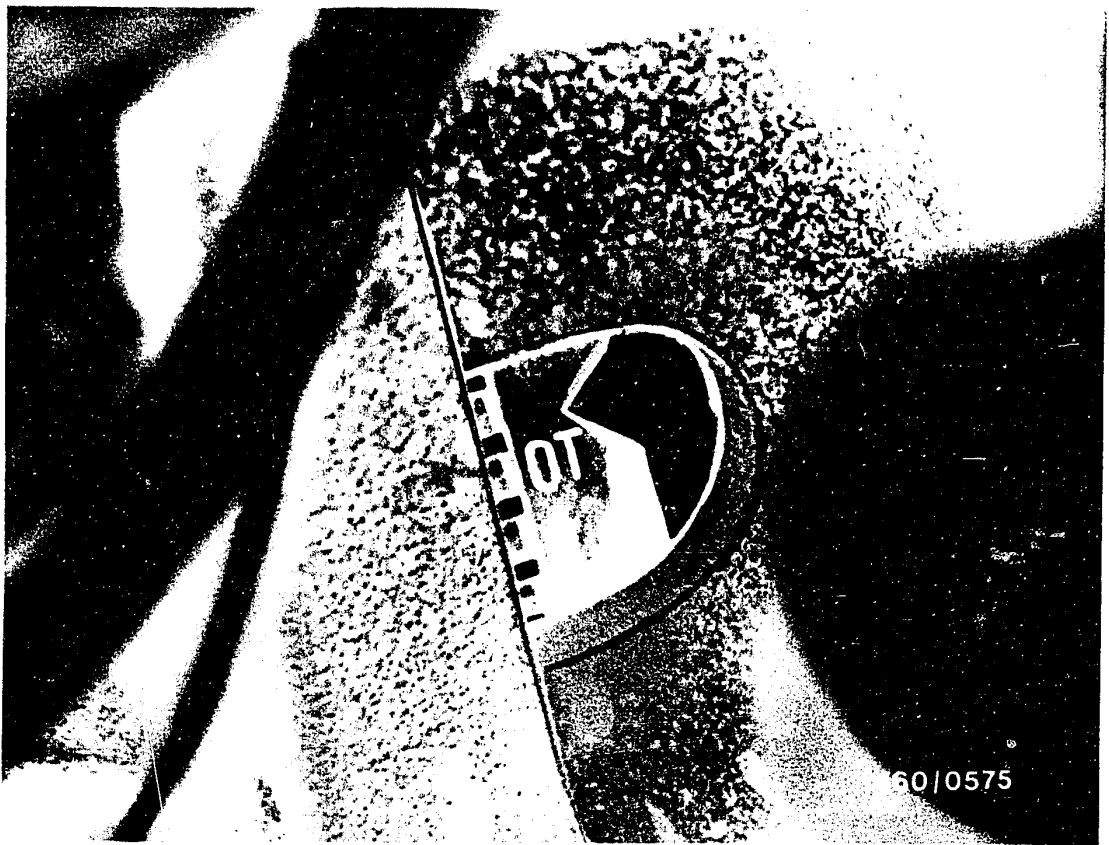
To do this, introduce mandrel through opening in cover plate (arrow).

G 16

Test and adjust engine timing

Volvo 240D, 740D, + 760D-Turbo





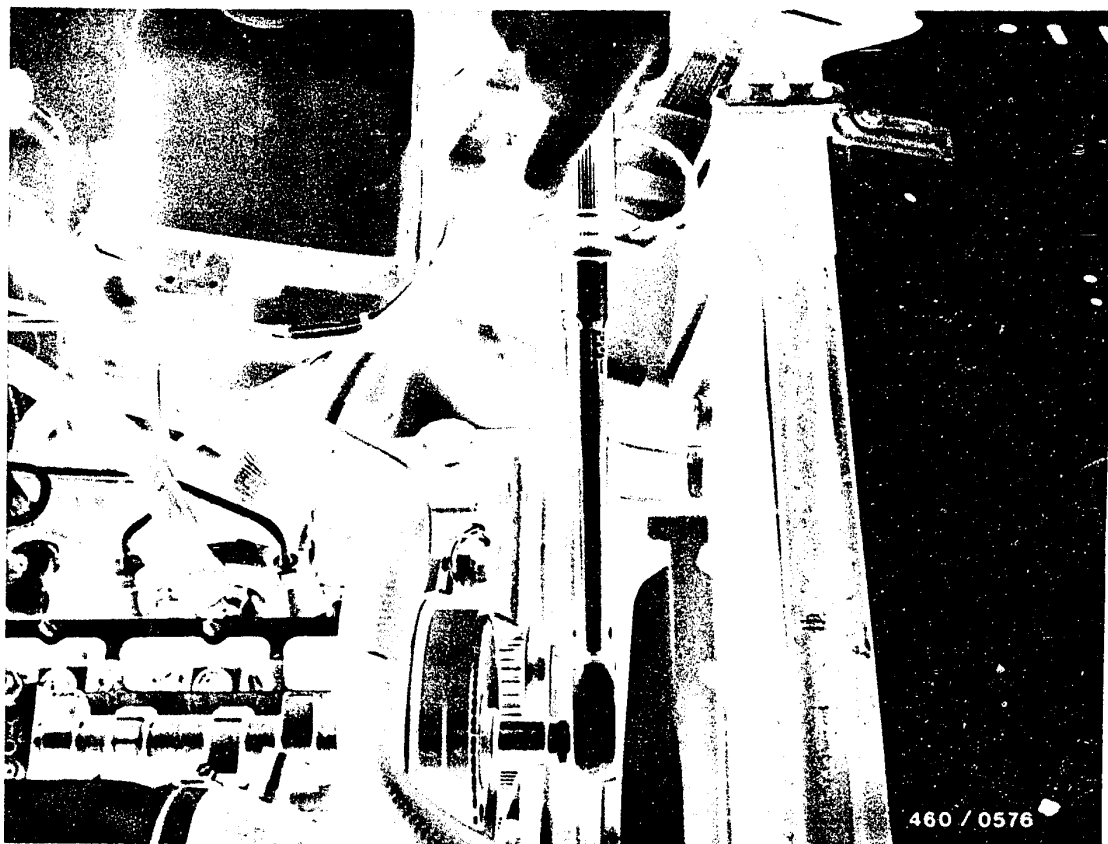
Turn crankshaft until TDC mark on flywheel and clutch housing are in alignment.

G17

Test and adjust engine timing

Volvo 240D, 740D + 760D-Turbo





In this position, tighten camshaft drive gear to 45 Nm.

Remove setting rule KDEP 1117.

Mount toothed-belt guard and cylinder head cover.

G 18

Test and adjust engine timing
Volvo 240D, 740D + 760D-Turbo





Mount toothed-belt for injection pump with camshaft gear.

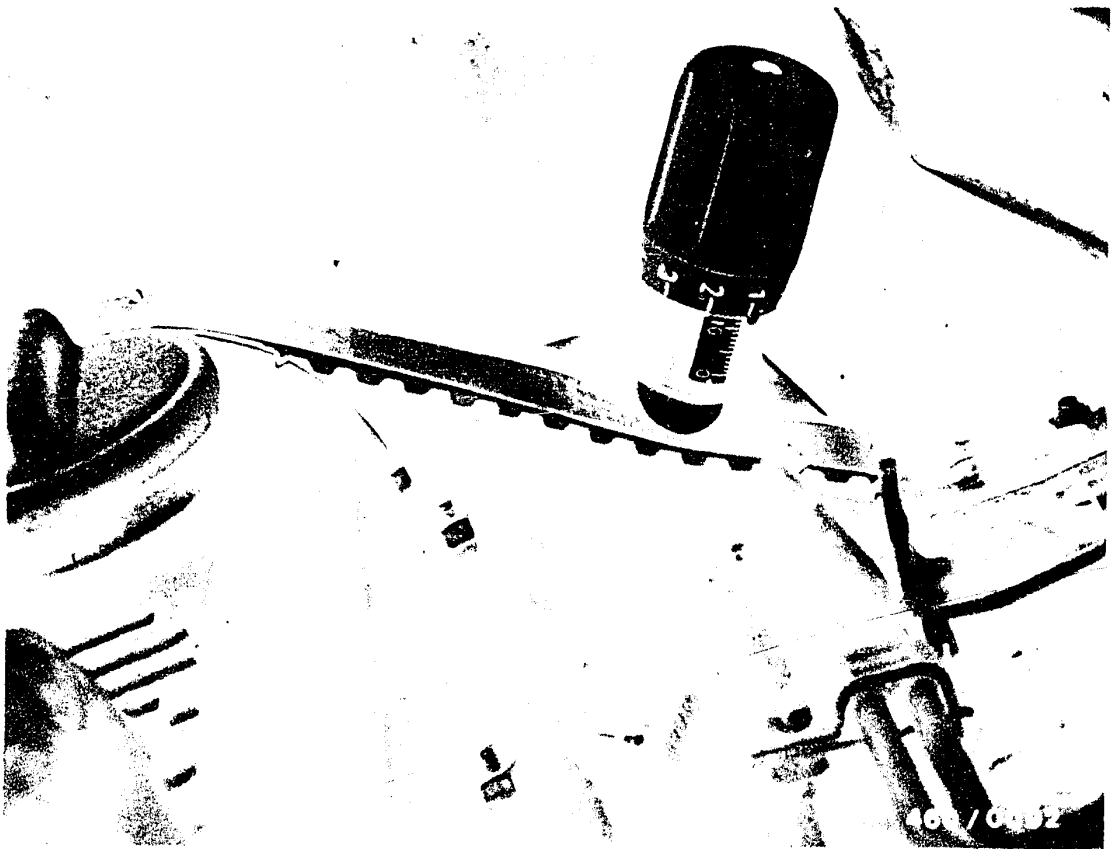
Tighten fastening screw by hand just enough so that camshaft gear can still be moved.

Remove setting mandrel KDEP 1122.

G 19

Test and adjust engine timing
Volvo 240D, 740D + 760D-Turbo





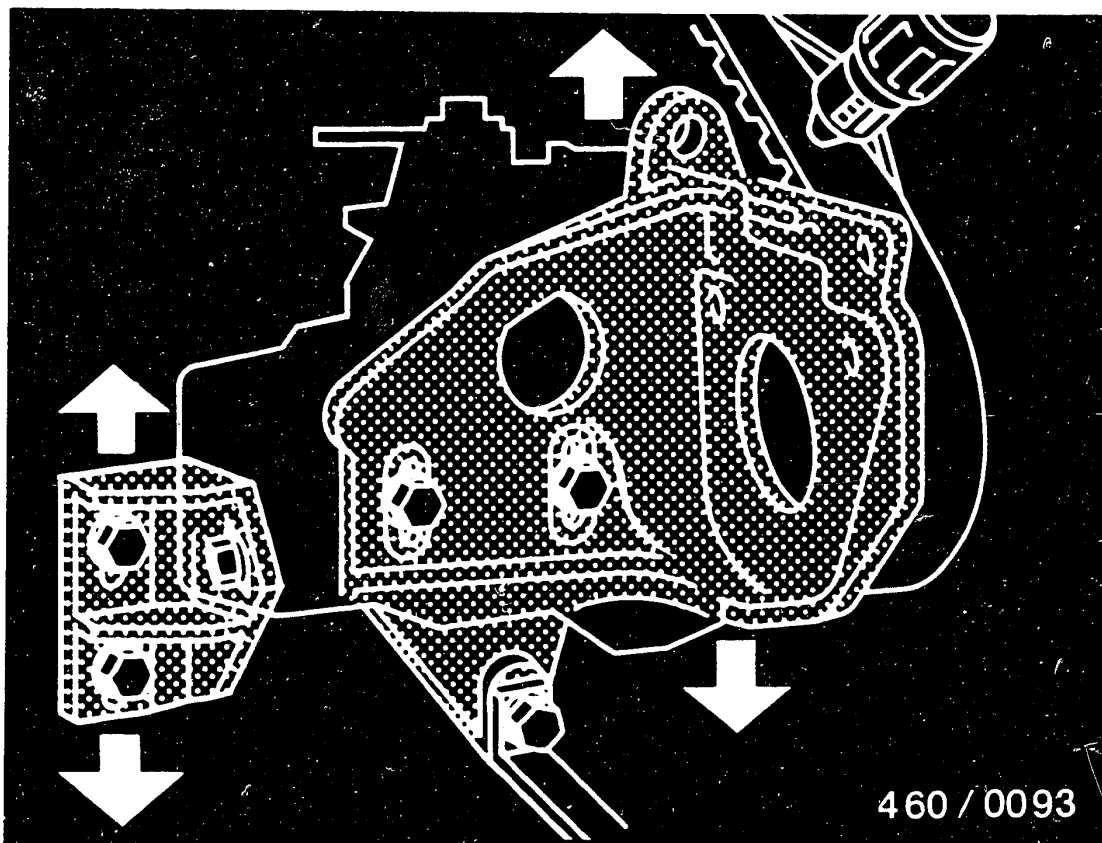
Test tension of toothed belt using belt tension tester KDEP 1121.

Mount belt tension tester as shown in the picture.

Turn vernier sleeve until bottom edge of sleeve aligns with the line mark on the measuring lug.

Make reading:

Checking value:	12...13
Setting value:	12.5



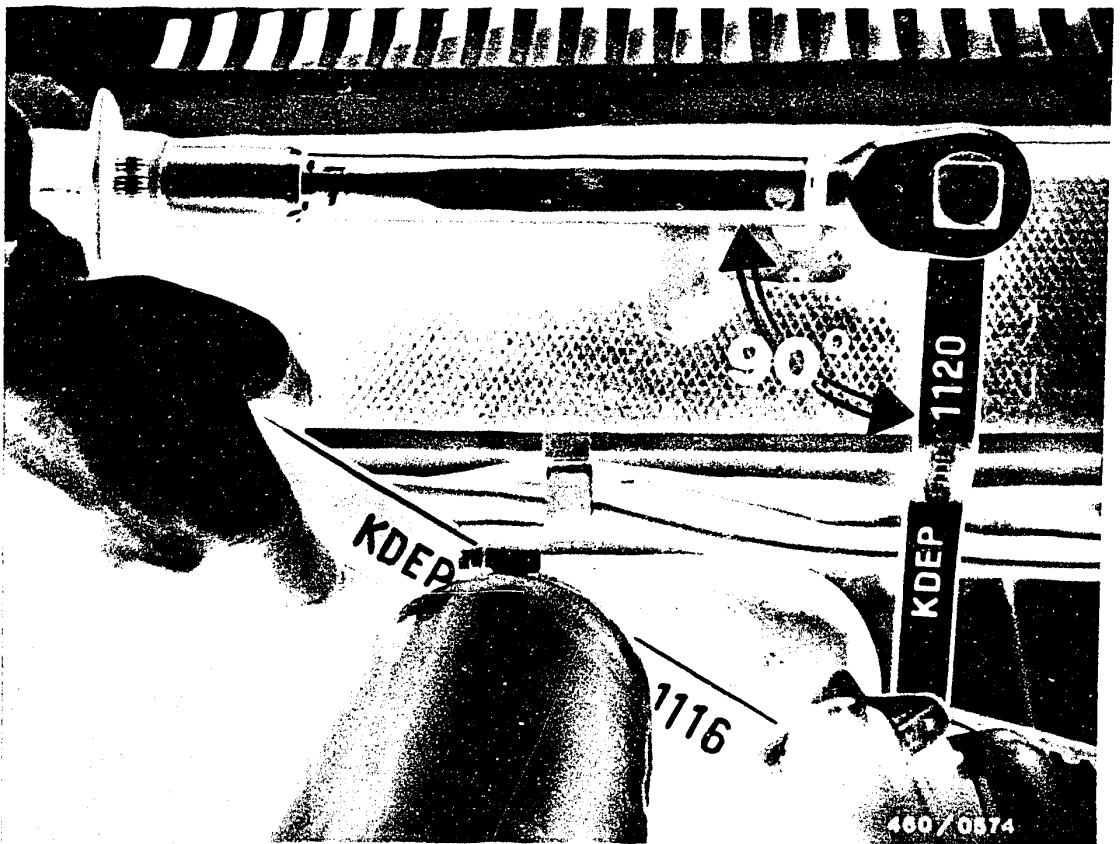
If the measured dimension differs from the set value, loosen fastening screws of pump bracket and of holding bracket on hydraulic head.

- Move injection pump with bracket up or down as required (arrows).

Tighten fastening screws of pump bracket and of holding bracket to 65 Nm.

Turn engine crankshaft over twice and check tension of toothed belt again.





Note:

For the following operation, make sure that the torque wrench is plugged onto the box wrench KDEP 1120 so that both wrenches are exactly at right angles (90°) to each other.

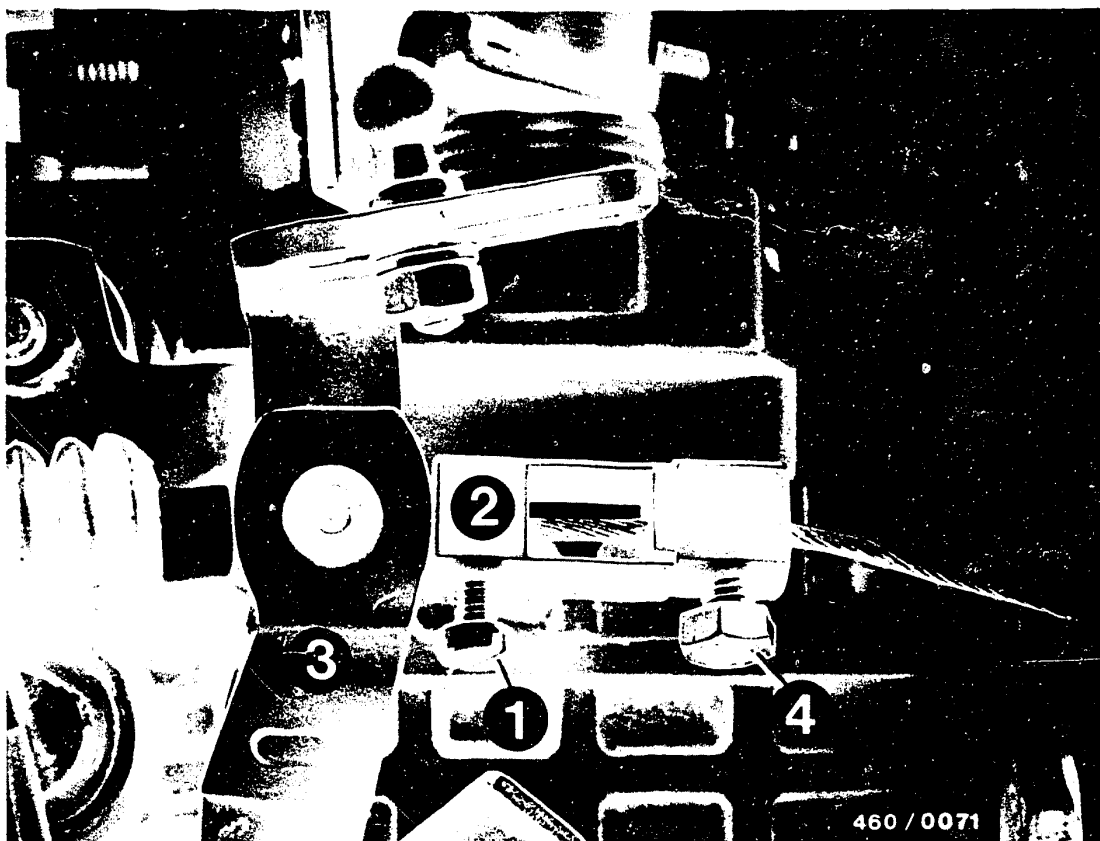
If this is not done, the tightening torque will be incorrect.

Check TDC position of crankshaft.

Lock injection-pump gear using setting mandrel KDEP 1122.

Lock camshaft gear with holder KDEP 1116 and tighten to 100 Nm by means of box wrench KDEP 1120.

Remove setting mandrel KDEP 1122.



When testing and adjusting the start of delivery, the temperature-controlled cold-start accelerator must be in the zero position.

Loosen clamping screw (1) on injection pump.

Pull intermediate piece (2) with control lever (3) towards hydraulic head.

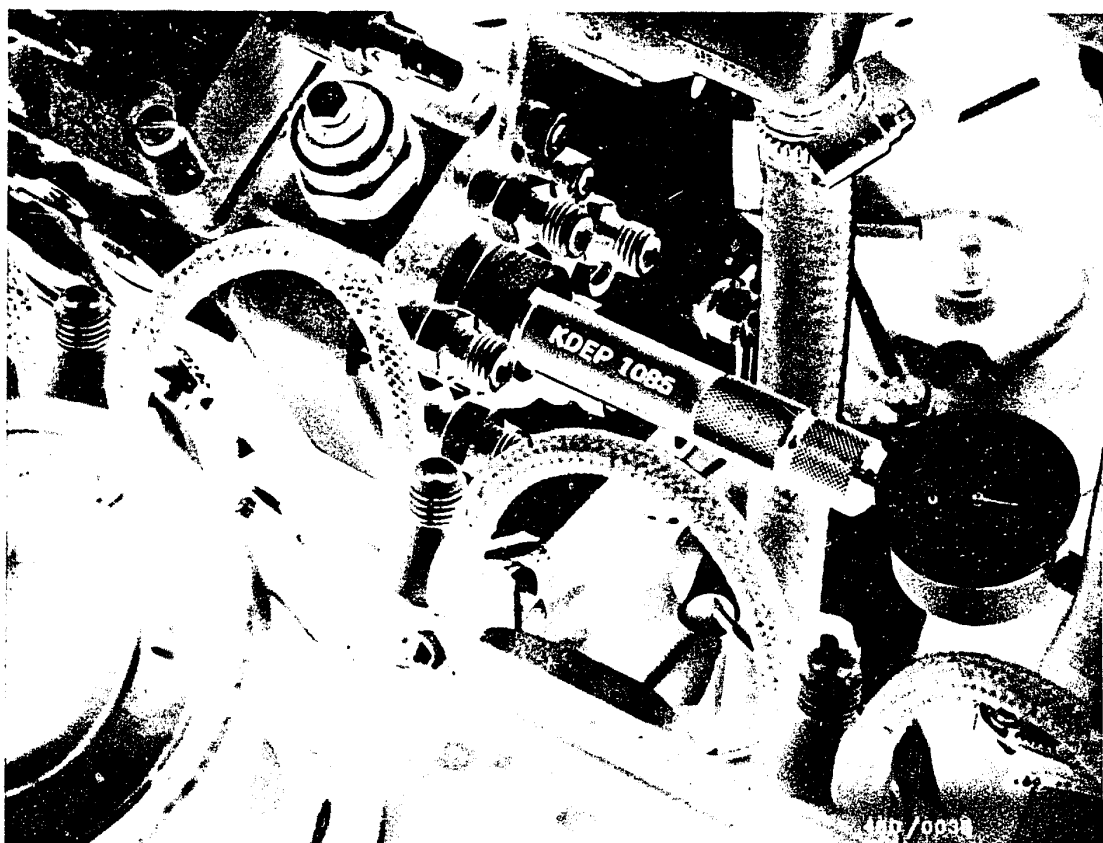
Turn intermediate piece (2) through 90° and push again toward drive shaft until control lever (3) is up against the stop bracket.

In this position, the control device is off.

Caution!

Locating screw (4) must not be loosened, since, otherwise, it will be necessary to reset the control device.





Remove the fuel-injection lines on the fuel-injection pump and the nozzle holder assemblies (prevent loosening of the pressure valve holders by holding them with the wrench).

Unscrew the bleeder screw from the center screw plug (triangular screw) of the hydraulic head.

Mount measuring device KDEP 1085 and dial indicator in the threaded hole.



Preload dial indicator by approx. 2.5 mm

Slowly turn crankshaft against engine direction of rotation until the pointer of the dial indicator no longer moves.

Set the dial indicator at "0".

Turn crankshaft in engine direction of rotation until TDC mark on flywheel aligns with reference mark on clutch housing.

Check position of pump gear using setting mandrel KDEP 1122.

The dial indicator must show one of the following values as checking dimension.

Pump position 0.75...0.83 mm after BDC (engine D 20)

Pump position 0.65...0.73 mm after BDC (engine D 24)

Pump position 0.87...0.95 mm after BDC (engine D 24 Turbo)





If a correction is necessary, loosen injection-pump fastening screws and set the respective stroke by pivoting.

Setting values:

Pump position 0.80 mm after BDC (engine D 20)

Pump position 0.70 mm after BDC (engine D 24)

Pump position 0.90 mm after BDC (engine D 24 Turbo)

Tighten fastening screws to 25 Nm.

Turn crankshaft over twice and check setting.



Remove measuring device KDEP 1085 and dial indicator.

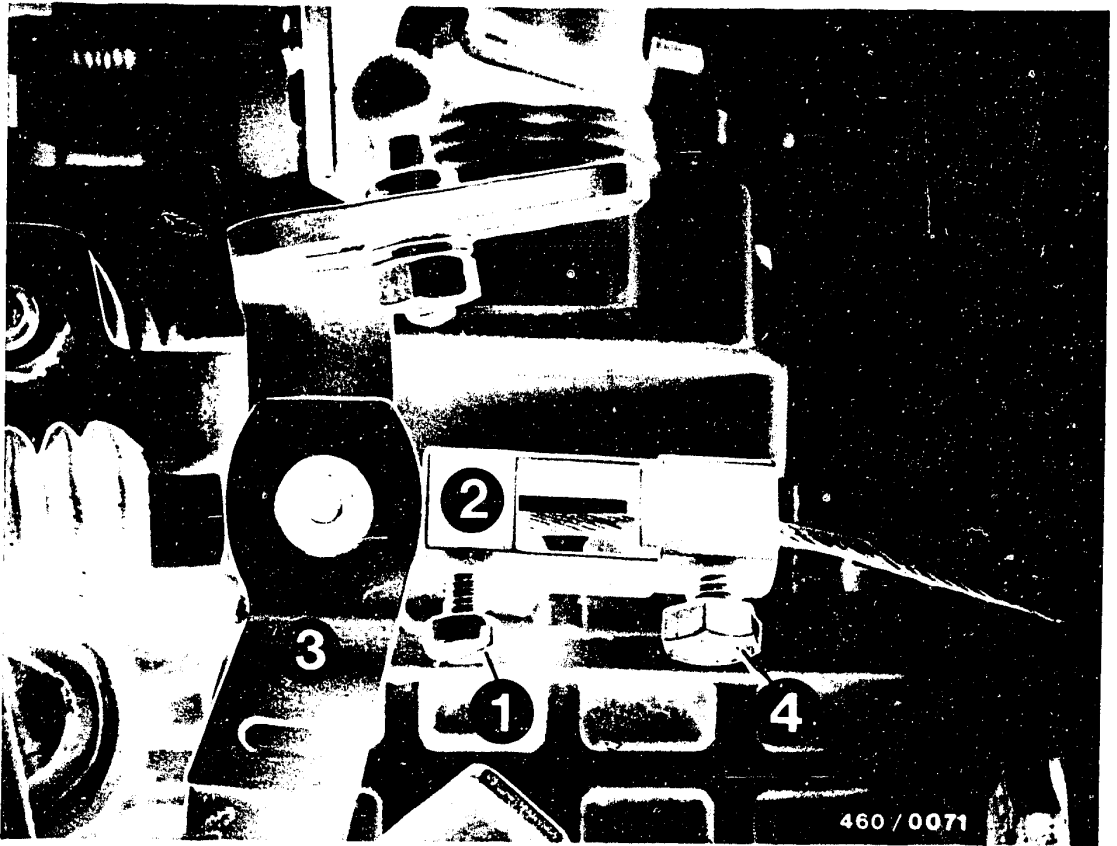
Screw in the bleeder screw using a new seal ring.

Put on the toothed-belt cover.

Screw the fuel-injection lines on the pressure valve holders for the fuel-injection pump and the nozzle holder assemblies (prevent turning of the pressure valve holders by holding them with a wrench).

If necessary, bleed fuel system.





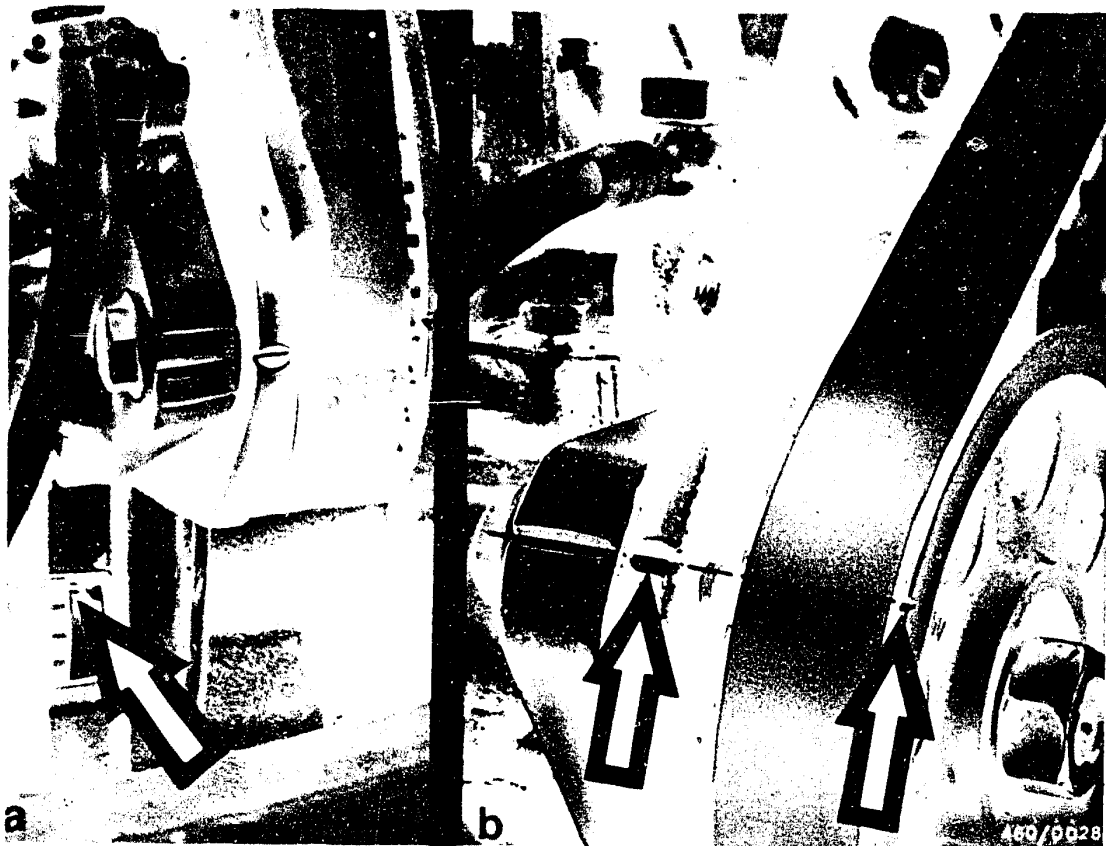
Pull control lever (3) with intermediate piece (2) toward hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft.

Intermediate piece is in starting position.

Tighten clamping screw (1).





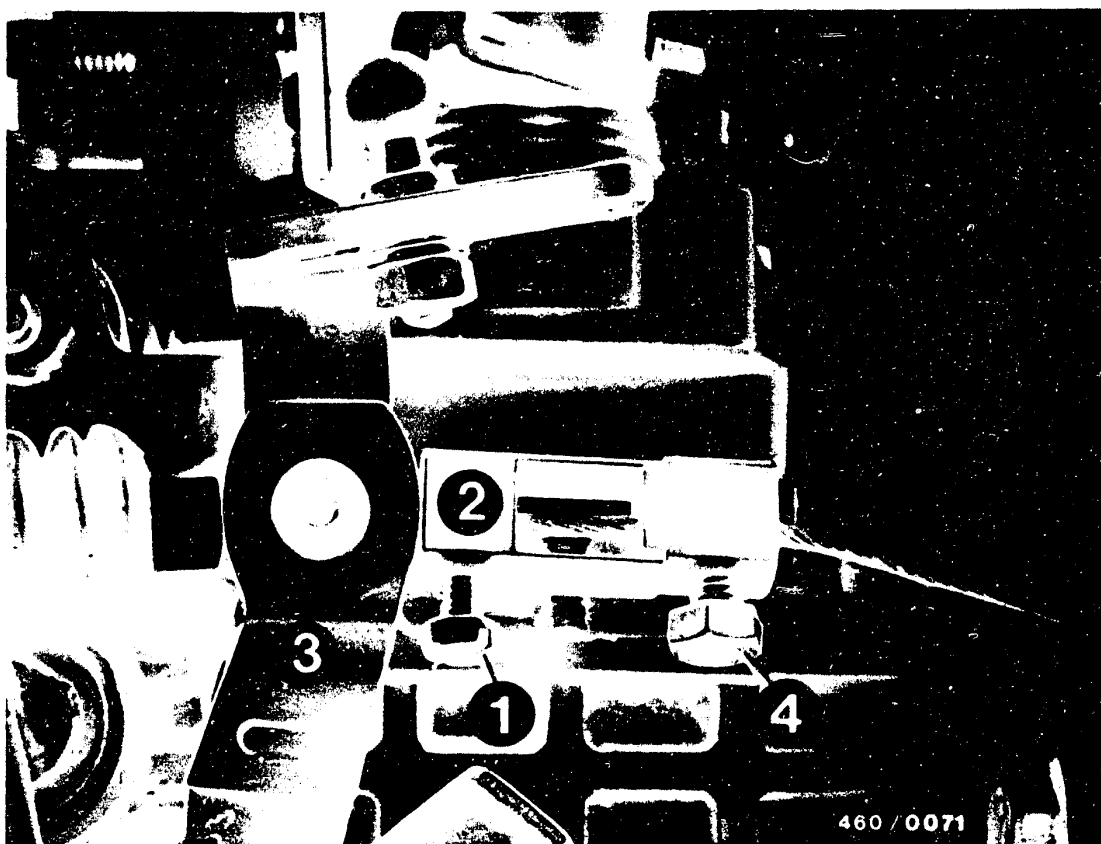
29. Injection timing

Remove toothed-belt guard and injection lines.

Turn crankshaft until TDC mark on flywheel aligns with reference mark on clutch housing.

In this position, notch marks on injection-pump gear and pump bracket must be in alignment.





When testing and adjusting the start of delivery, the temperature-controlled cold-start accelerator must be in the zero position.

Loosen clamping screw (1) on injection pump.

Pull intermediate piece (2) with control lever (3) towards hydraulic head.

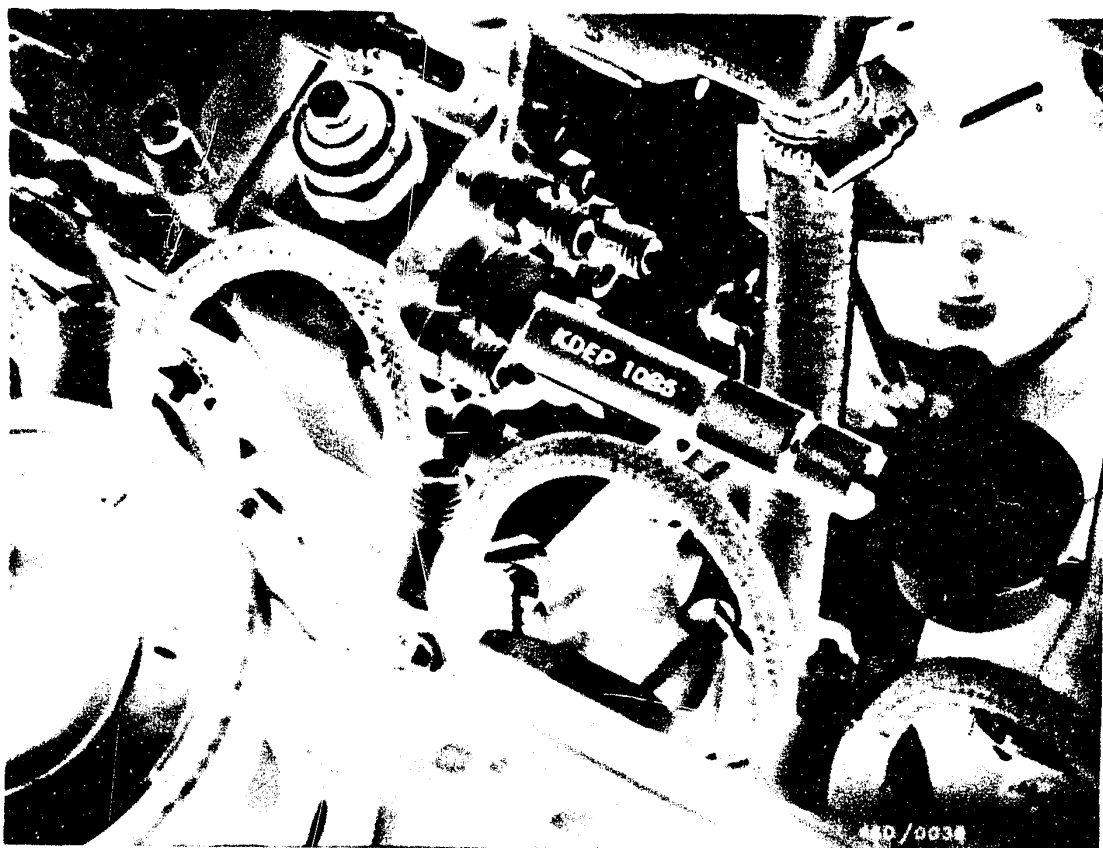
Turn intermediate piece (2) through 90° and push again toward drive shaft until control lever (3) is up against the stop bracket.

In this position, the control device is off.

Caution!

Locating screw (4) must not be loosened, since, otherwise, it will be necessary to reset the control device.





Remove the fuel-injection lines on the fuel-injection pump and the nozzle holder assemblies.

Caution !

Prevent the pressure valve holders from becoming loose by holding them with a wrench.

Screw out the bleeder screw from the central screw plug (triangular plug) of the hydraulic head.

Mount measuring device KDEP 1085 and dial indicator in the threaded hole.

H7

Injection timing

Volvo 240D, 740D, + 760D-Turbo



Preload dial indicator by approx. 2.5 mm

Slowly turn crankshaft against engine direction of rotation until the pointer of the dial indicator no longer moves.

Set the dial indicator at "0".

Turn crankshaft in engine direction of rotation until TDC mark on flywheel aligns with reference mark on clutch housing.

Check position of pump gear using setting mandrel KDEP 1122.

The dial indicator must show one of the following values as checking dimension.

Pump position 0.75...0.83 mm after BDC (engine D 20)

Pump position 0.65...0.73 mm after BDC (engine D 24)

Pump position 0.87...0.95 mm after BDC (engine D 24 Turbo)





If a correction is necessary, loosen injection-pump fastening screws and set the respective stroke by pivoting

Setting values:

Pump position 0.80 mm after BDC (engine D 20)

Pump position 0.70 mm after BDC (engine D 24)

Pump position 0.90 mm after BDC (engine D 24 Turbo)

Tighten fastening screws to 25 Nm.

Turn crankshaft over twice and check setting.



Remove measuring device KDEP 1085 and dial indicator.

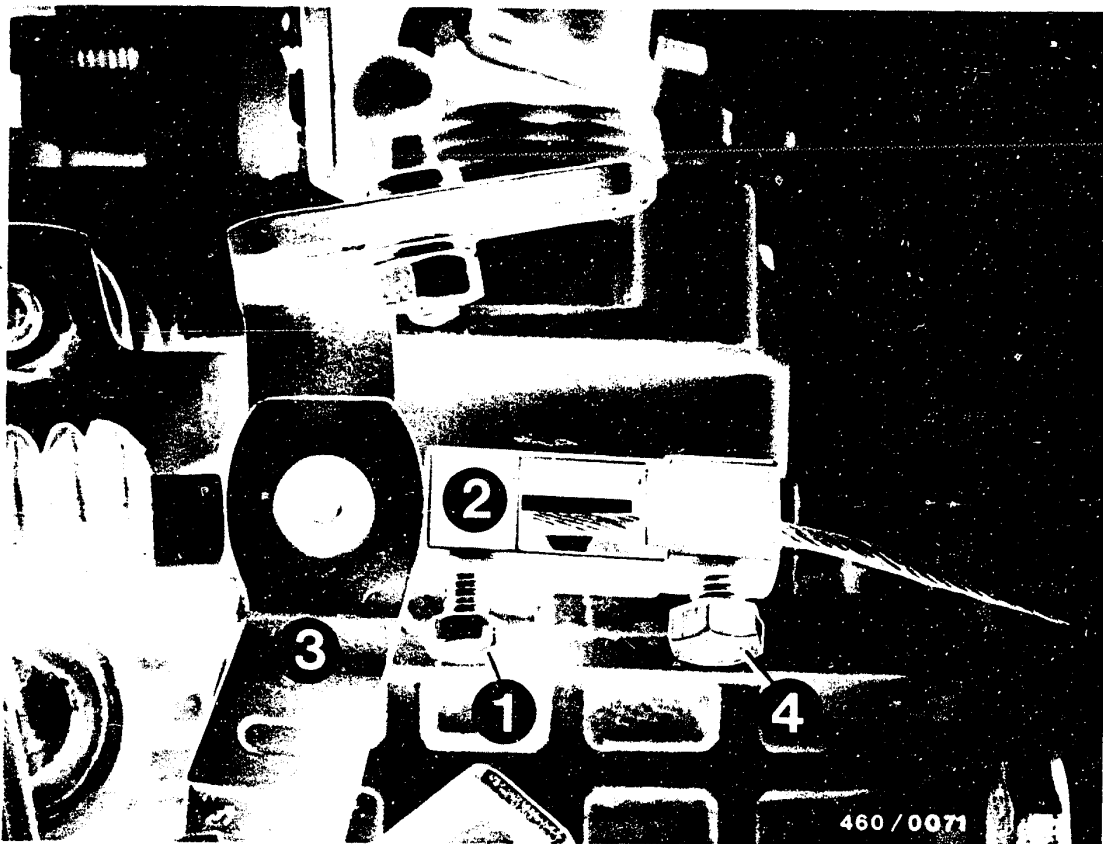
Screw in the bleeder screw using a new seal ring.

Put on the toothed-belt cover.

Screw the fuel-injection lines on the pressure valve holders for the fuel-injection pump and the nozzle holder assemblies (prevent turning of the pressure valve holders by holding them with a wrench).

If necessary, bleed fuel system.





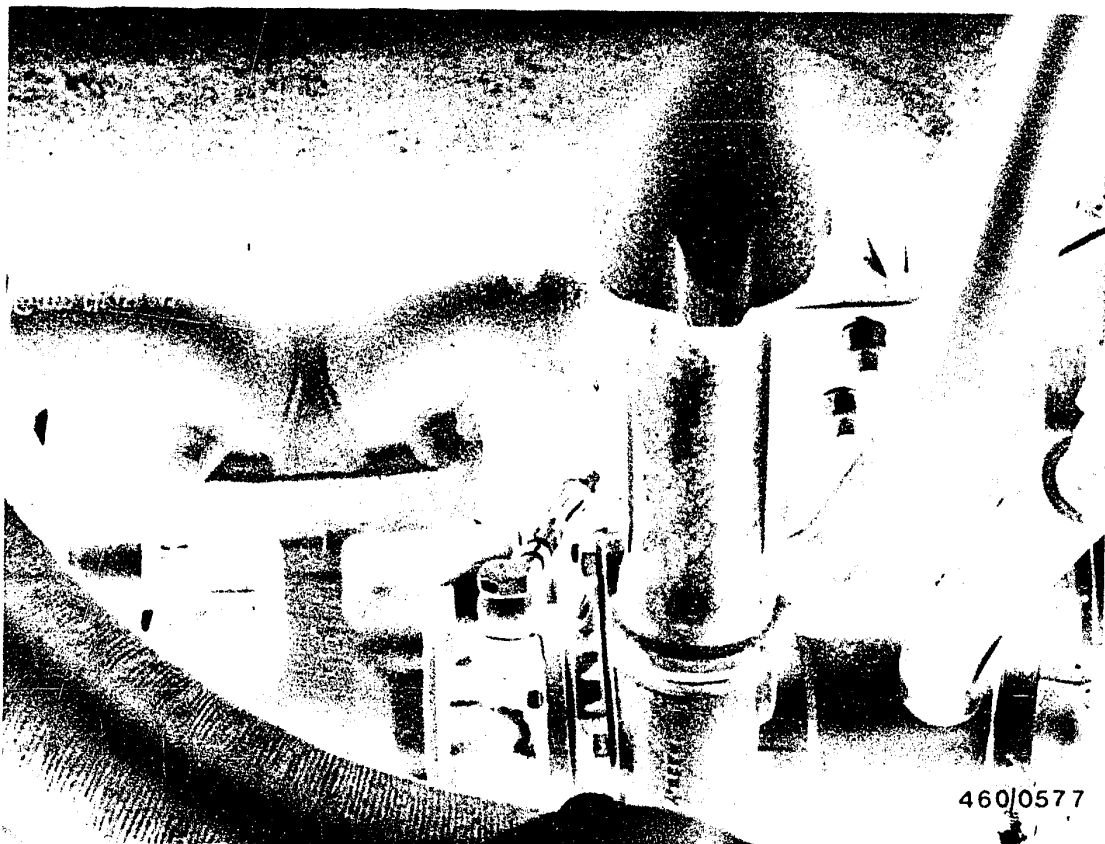
Pull control lever (3) with intermediate piece (2) toward hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft.

Intermediate piece is in starting position (picture).

Tighten clamping screw (1).





30. Test charge-air pressure

When working on the turbocharger, it should be noted that even the smallest particles of dirt can lead to the destruction of the turbocharger.

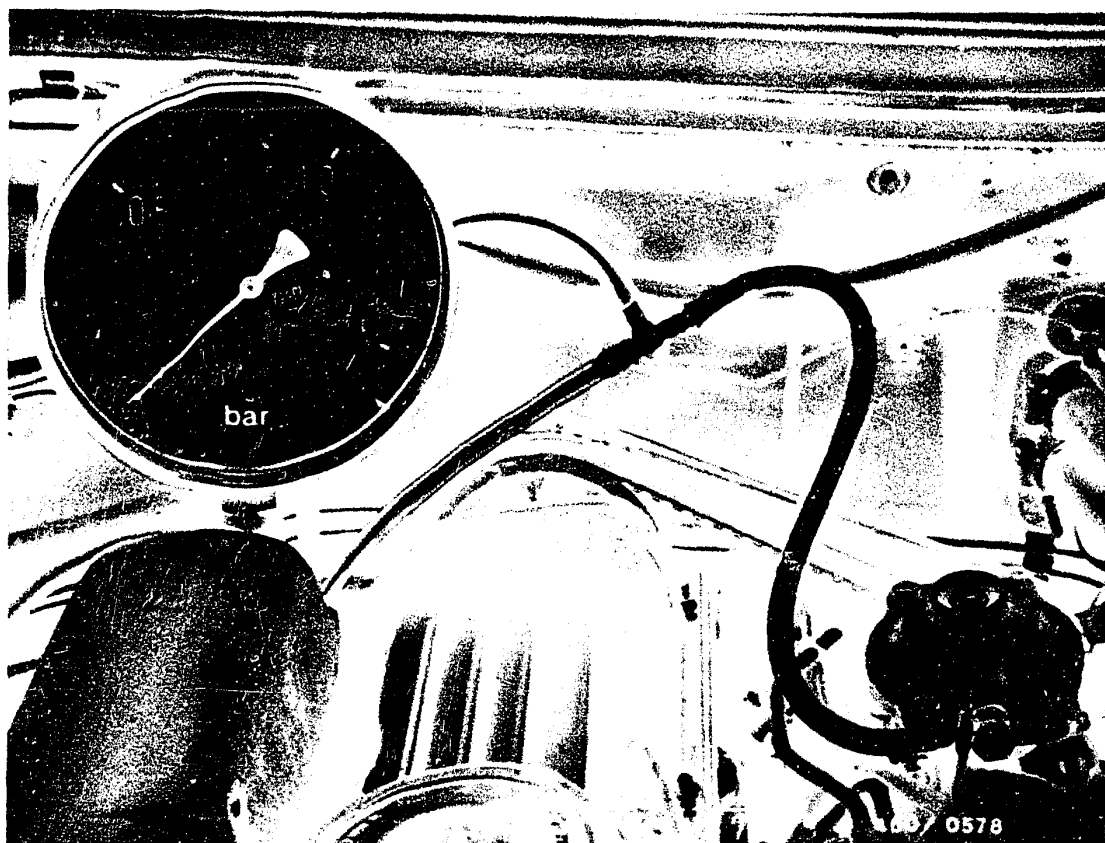
Therefore, never operate the engine without air filter.

H12

Test charge-air pressure

Volvo 240D, 740D + 760D-Turbo



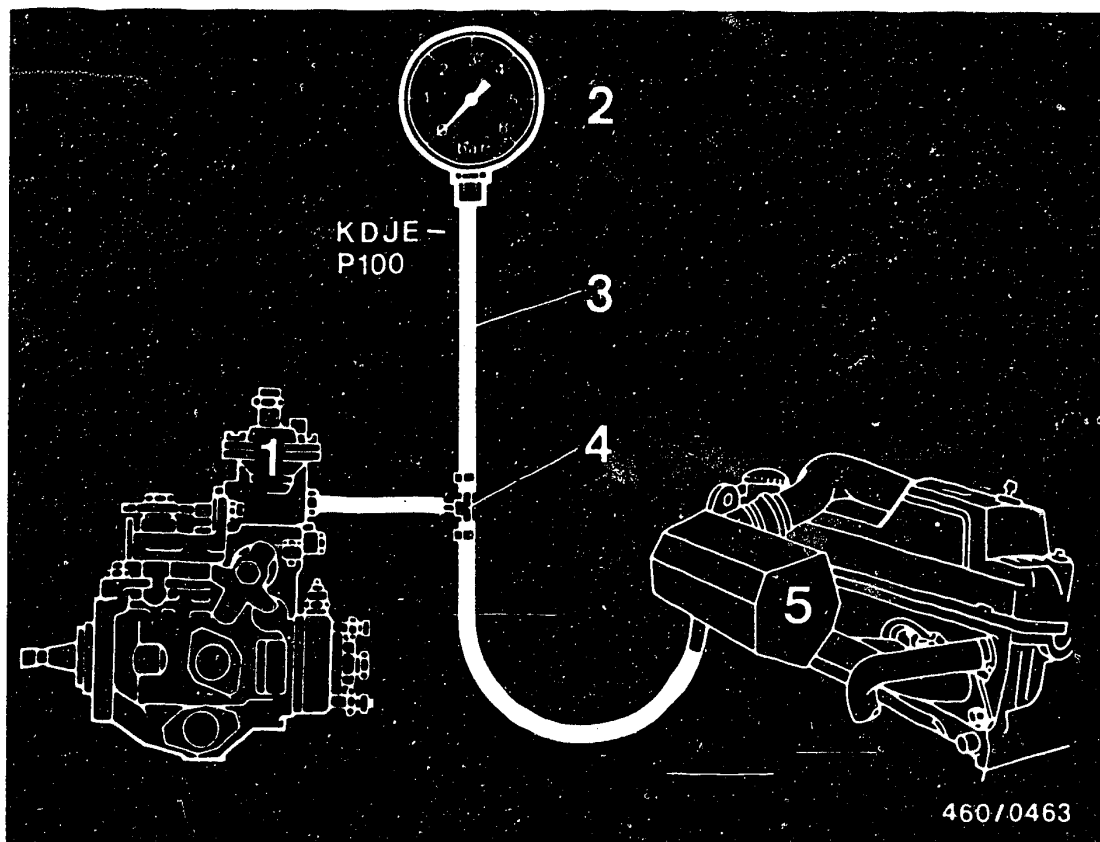


To test the charge-air pressure, it is possible to use pressure tester KDJE-P 100, or a pressure gauge 0...1.6 bar (e.g. Wika No. 4184) (picture).

H13

Test charge-air pressure
Volvo 240D, 740D + 760D-Turbo





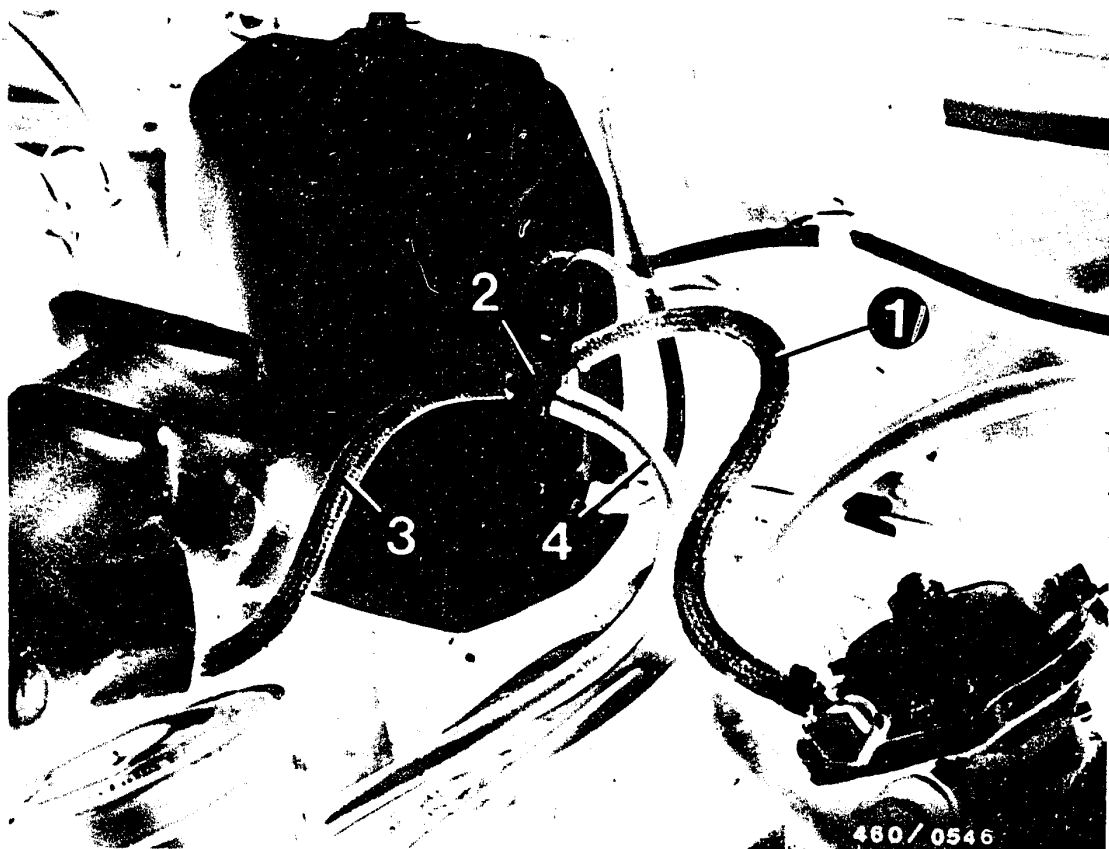
1 = LDA
2 = Pressure tester
3 = Connecting hose

4 = T-piece
5 = Charge-air tube

Mounting the pressure tester (KDJE-P 100)

Pull off connecting hose between charge-air tube and injection pump (ALDA-housing) on one side.

Insert connecting hose with T-piece and connect to pressure tester.



Mounting the pressure gauge for measuring the charge-air pressure

Pull connecting hose (1) between charge-air tube and injection-pump manifold-pressure compensator off the charge-air tube (arrow).

Plug on Y-piece (2).

Make connection to charge-air tube using commercially available hose (3).

Plug connection hose of pressure gauge onto Y-piece (4).

Measurement of charge-air pressure

Requirement: engine at normal operating temperature.

Measure charge-air pressure

Drive in 3rd gear at an engine speed of 1500 min^{-1} or select driving range 2 with automatic transmission.

Depress accelerator pedal and accelerate at full throttle (as far as kick-down point with automatic transmission).

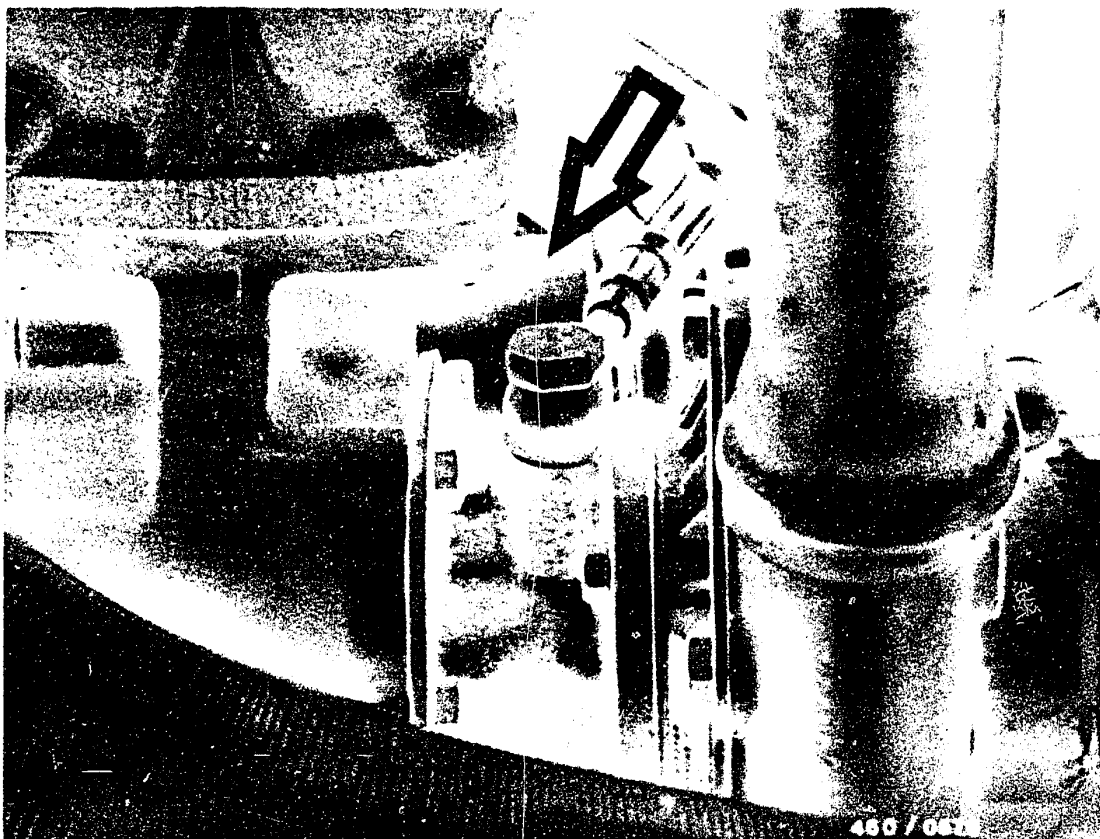
Brake at engine speed of 3000 min^{-1} and simultaneously read off the charge-air pressure on the pressure gauge.

Set value: $0.70 \dots 0.77 \text{ bar}$

Note:

To assess the exhaust-gas turbo-charger, it is essential that the start of delivery and nozzle-opening pressure be correctly adjusted, that there be no leaks on the air-intake and exhaust sides, and that the engine be in good mechanical condition (valve clearance, compression pressure).





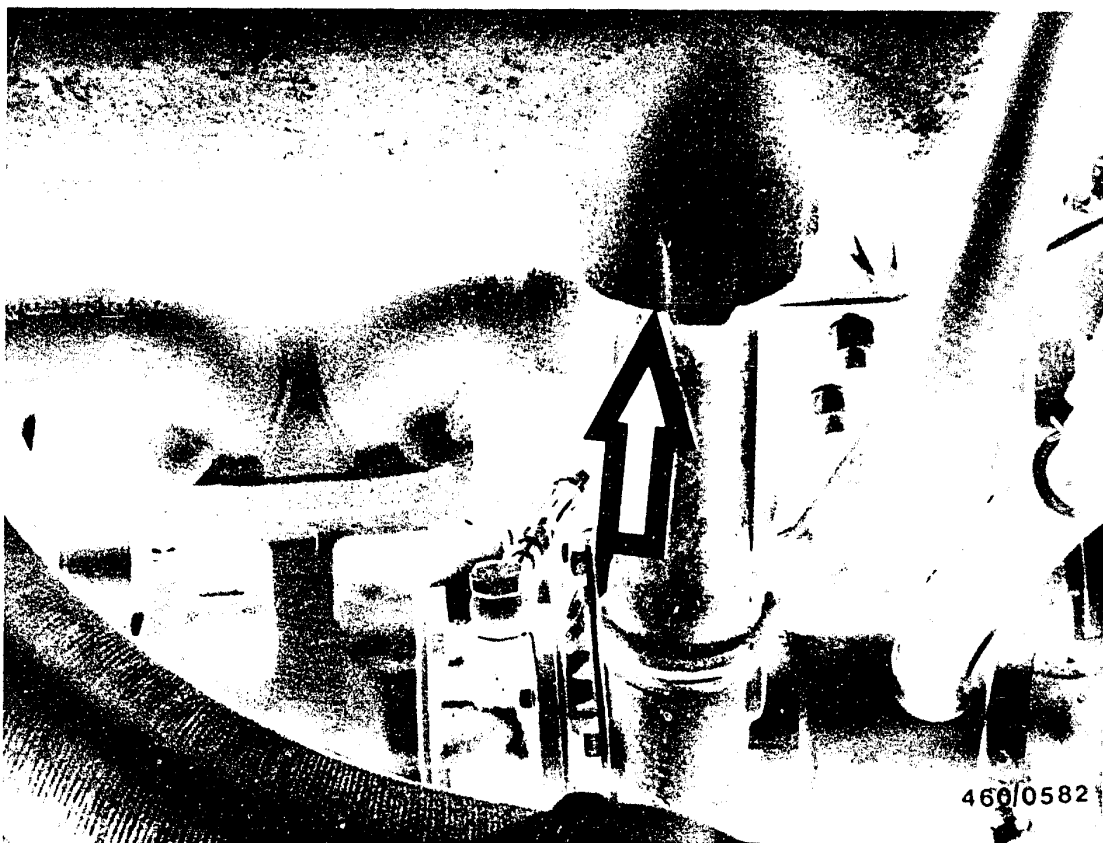
Charge-air pressure too high (high charge-air pressure warning lamp in instrument panel lit).

- Check wastegate

Remove turbocharger from engine and dismantle charger (separate turbocharger, bearing housing and turbine housing). Connect a pressure gauge with adapter valve to the thicker connecting hose of the wastegate. Slowly apply compressed air to wastegate. The valve must open 1.2...1.3 mm at 0.8 ± 0.04 bar.

If this degree of opening is not obtained, replace wastegate including turbine housing.



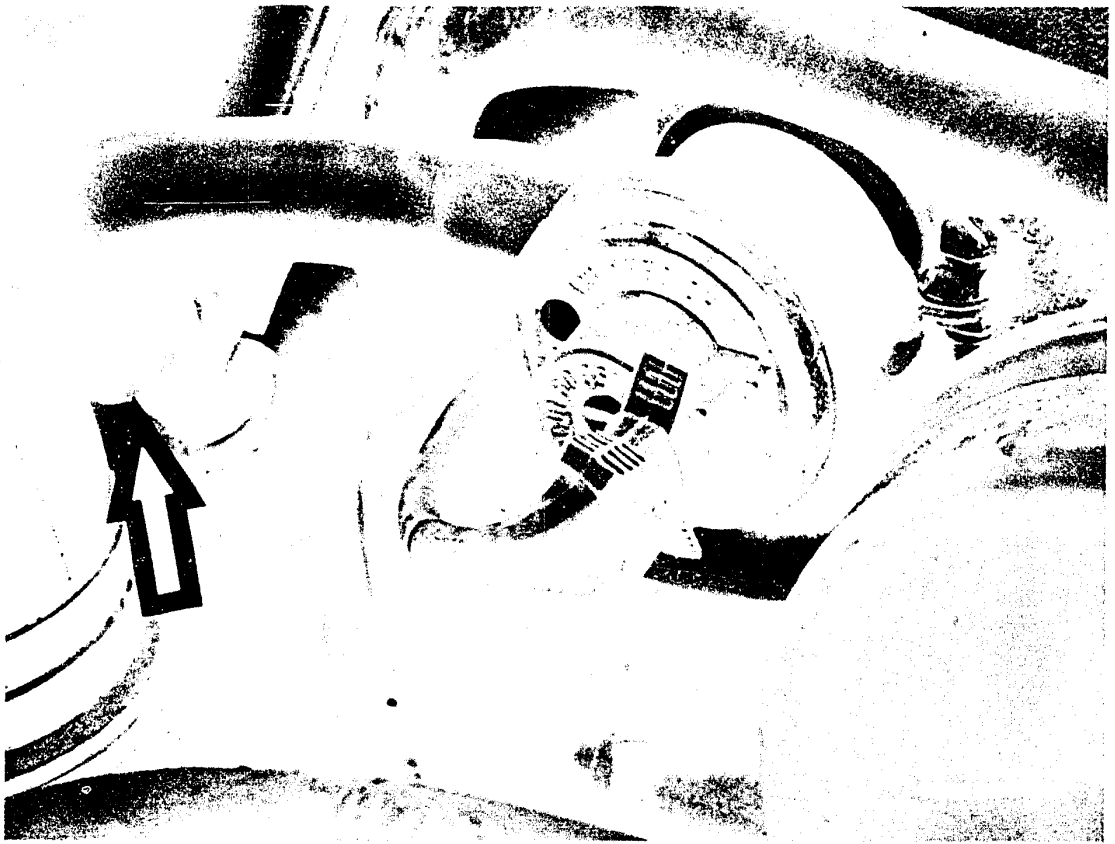


Charge-air pressure too low (leaks)

If the charge-air pressure is too low, test the following points for leaks:

- Seal between charge-air tube and engine block
- Connecting hose between charge-air tube and manifold-pressure compensator (injection pump)
- Diaphragm in manifold-pressure compensator
- Connecting tube between compressor outlet and charge-air tube (arrow)
- Seal between wastegate and turbocharger
- Hose connections on overpressure valve.





Charge-air pressure too low (no leaks)

Remove connecting hose between overpressure valve and turbocharger inlet from T-piece (arrow) and seal using suitable plug.

Repeat charge-air pressure test.





- Charge-air pressure 0.70 ... 0.77 bar
= Take out and replace overpressure valve (arrow)
- Charge-air pressure still too low
= As an experiment, take out and replace charge-air pressure control valve.

Then, if the specified value is not reached in a repeated check on the charge-air pressure, take out and replace the exhaust gas turbocharger.

Caution!

After putting in a new exhaust gas turbocharger, fill the charger with oil and run the engine for approx. 1 min. in order to guarantee the oil supply in the charger.



Motor Vehicle Service Information

Only for use within the Bosch organization. No to be communicated to any third party.

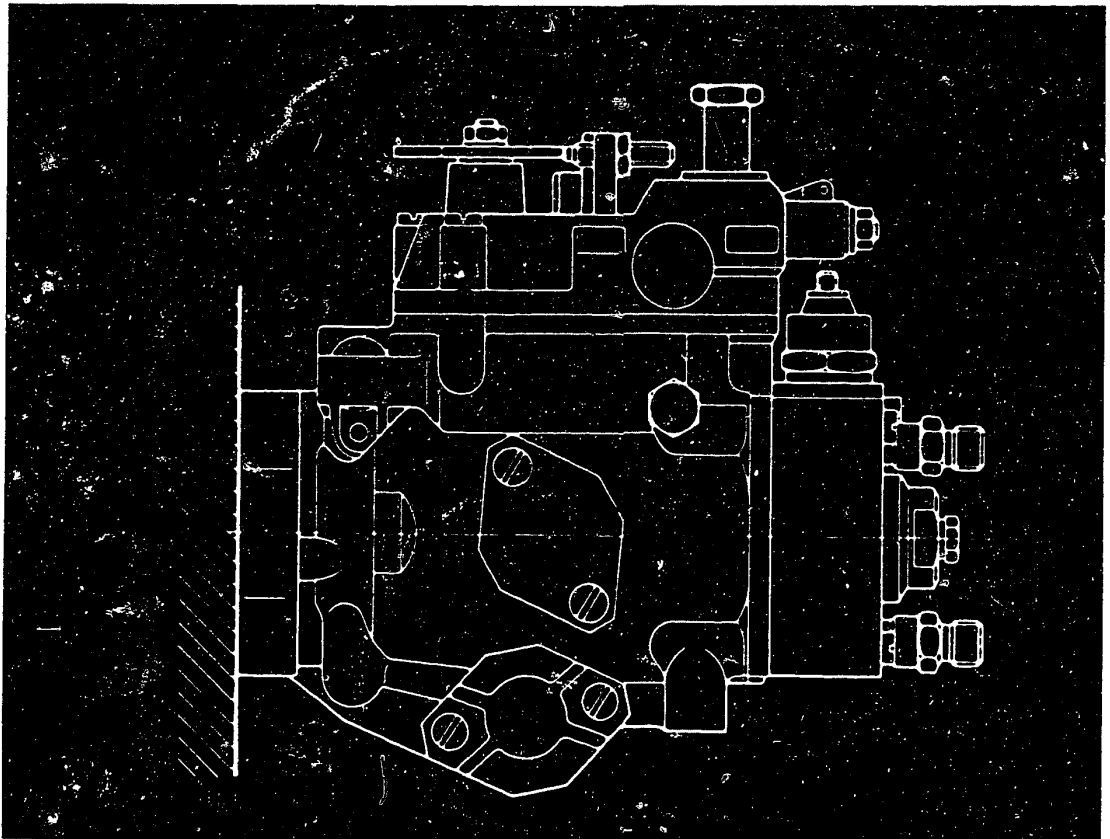
Fuel-injection equipment

BLEEDING OF DISTRIBUTOR-TYPE
FUEL-INJECTION PUMPS VE..F..

VDT-I-Gen. 069 En

11.1984

supersedes I-460/120 of 1.81



If distributor-type fuel-injection pumps are mounted on the engine, always fill injection pump and fuel filter with fuel.

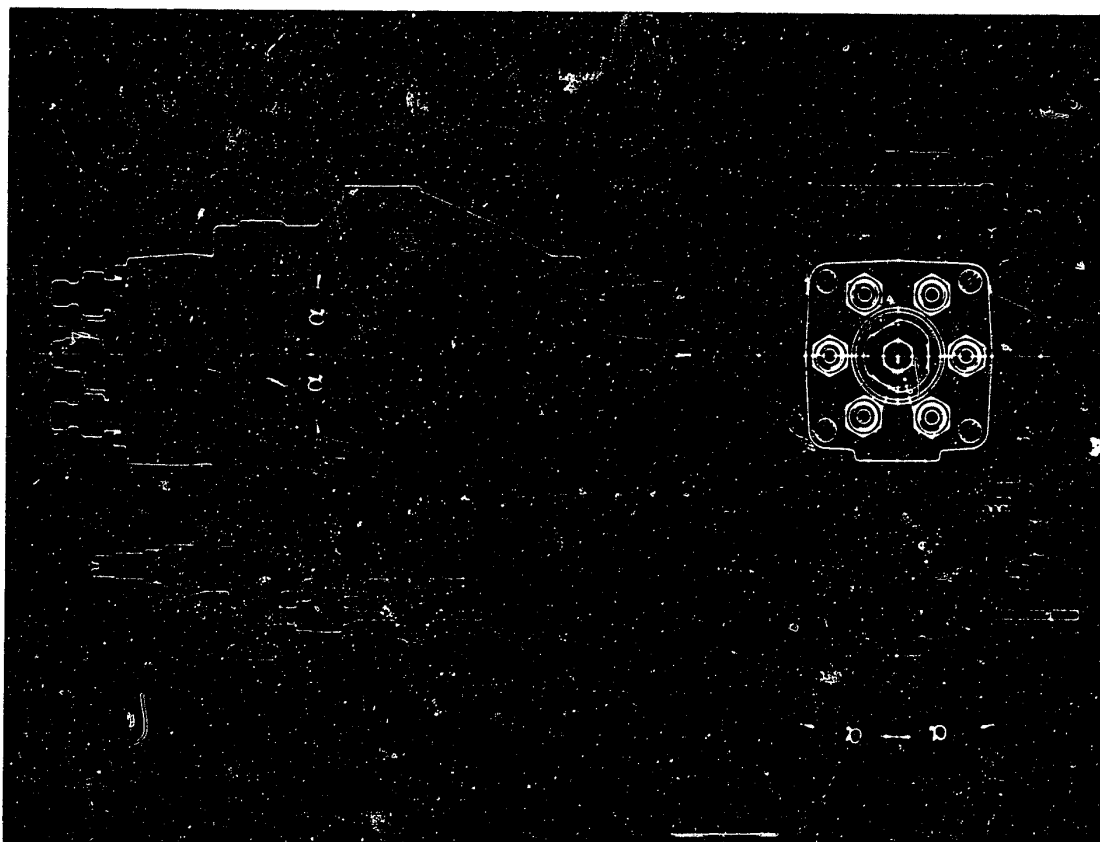
Horizontally (see picture) mounted distributor-type fuel-injection pumps do not need to be bled since the fuel overflow forms the highest point on the distributor-type pump, and the air in the distributor-type pump is forced back to the tank.

N1

Motor Vehicle Service Information

Volvo 240D, 740D + 760D-Turbo

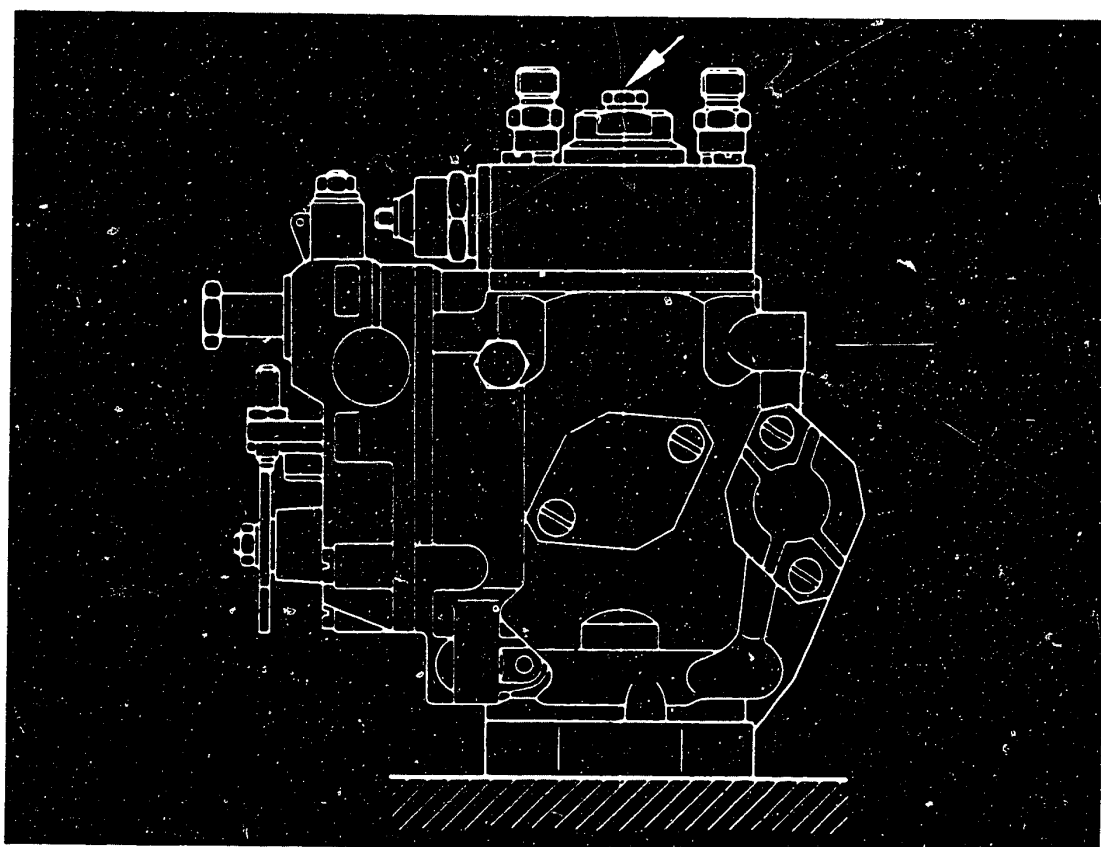




a = Angle of inclination

If the installation position differs by more than 45° (see picture) from the horizontal, then in most cases it will be necessary to bleed the distributor-type fuel-injection pump.

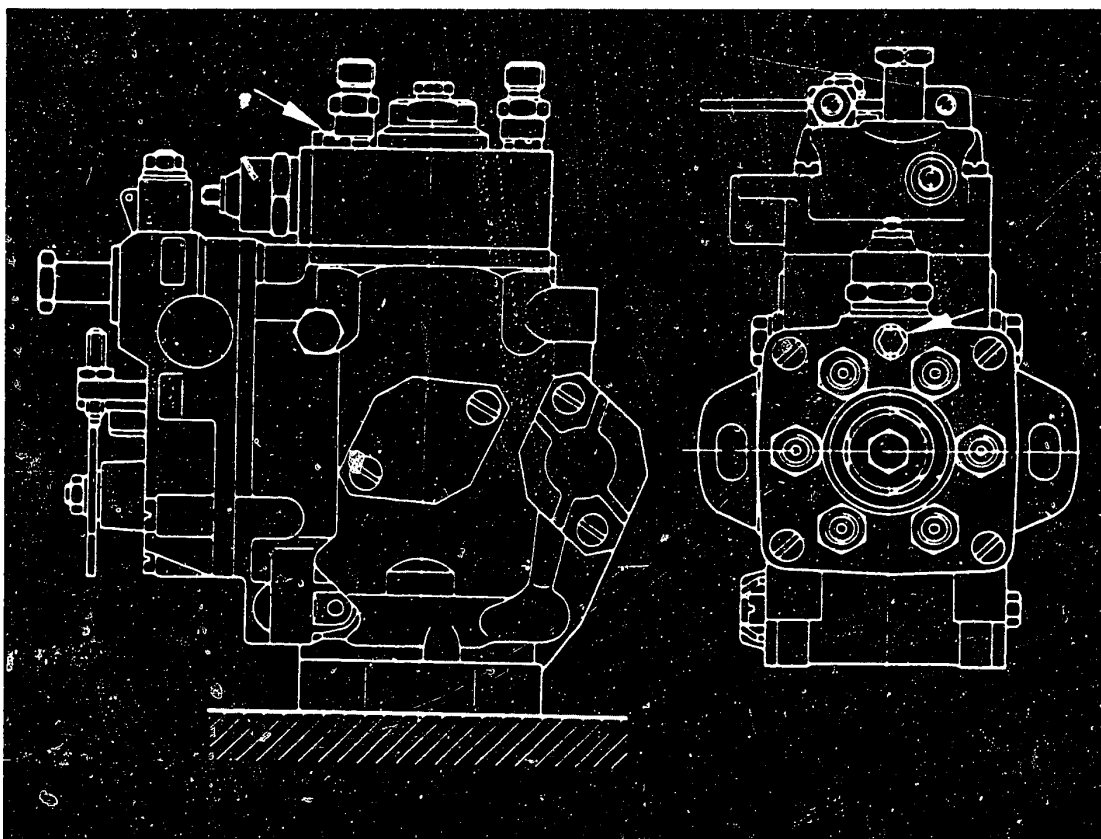




1. Vertical installation

To bleed vertically installed distributor-type fuel-injection pumps, open hexagon screw in central screw plug of hydraulic head (see picture, arrow) until flat place on thread becomes visible. Operate starting motor until fuel escaping at this point is free of bubbles; then re-tighten hexagon screw.

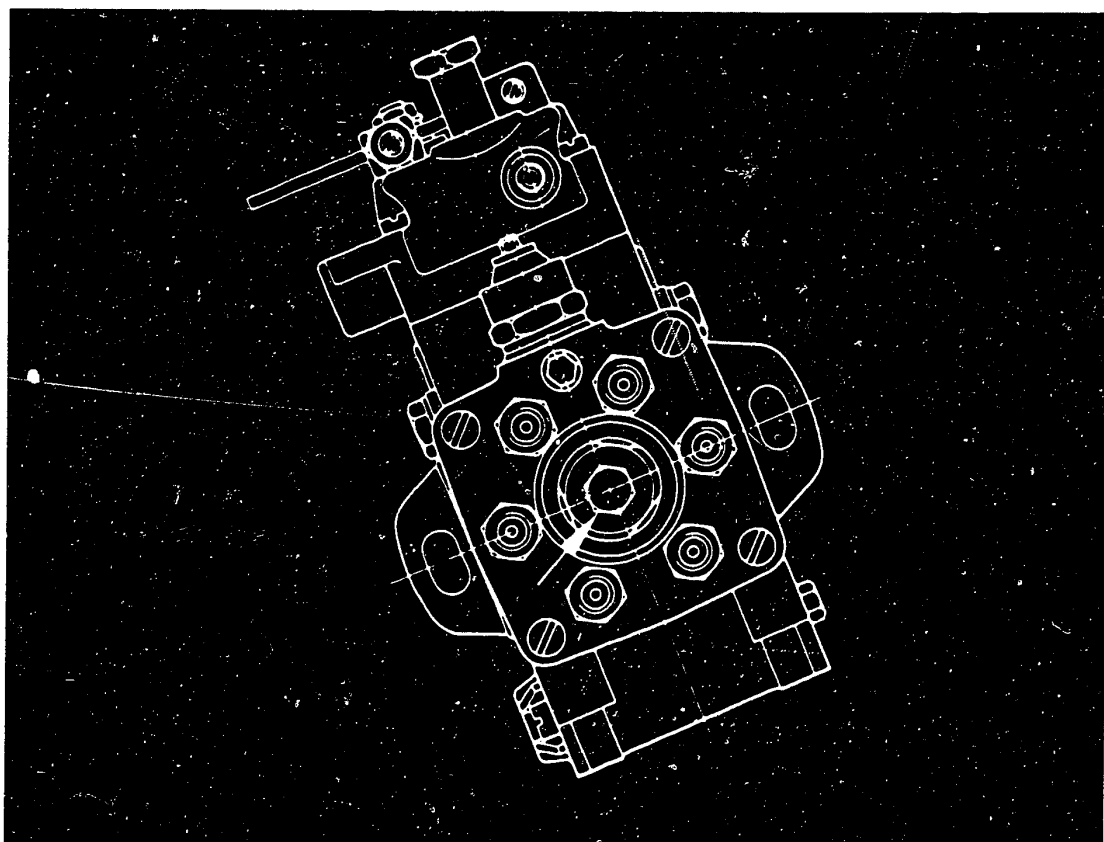




In various versions of distributor-type fuel-injection pump (VE), a hexagon-socket-head cap screw is positioned below the solenoid-operated valve (see picture, arrow).

To bleed these versions of pump, loosen this hexagon-socket-head cap screw. Operate starting motor until fuel escaping at this point is free of bubbles; then re-tighten hexagon-socket-head cap screw.

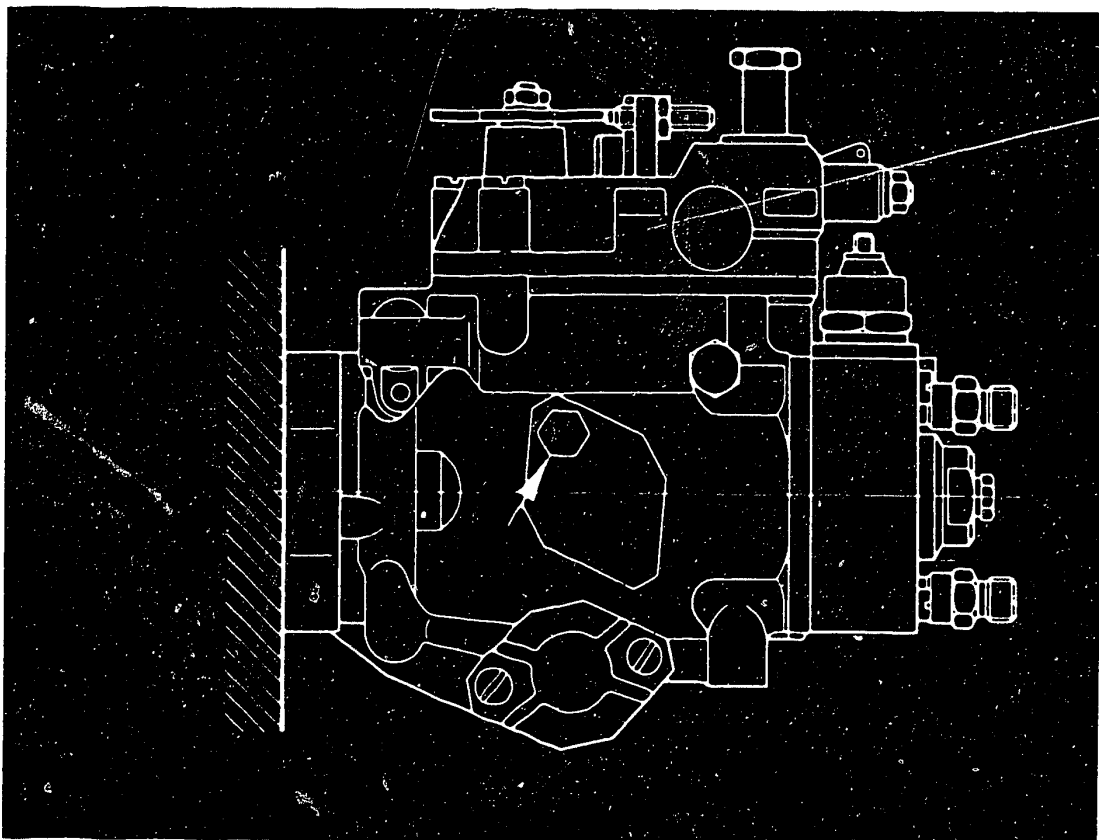




2. Horizontal installation

To bleed horizontally installed distributor-type pumps (see picture), it is necessary, as in the case of vertical installation, to loosen the hexagon screw (arrow) in the central screw plug of the hydraulic head, and to re-tighten it after the fuel escaping is free of bubbles.





In various versions of pump, the bleeder screw is positioned on the side of the pump housing, see picture. (Distributor-type pump is shown horizontal for better clarity).

To bleed these distributor-type pumps, loosen the hexagon screw (arrow) shown in the picture. Operate starting motor until fuel escaping at this point is free of bubbles; then re-tighten bleeder screw.

Published by:
Robert Bosch GmbH
Division KH
After-Sales Service Department for
Training and Technology (KH/VSK)

Please direct questions and comments concerning the contents to our authorized representative in your country.

N6

Motor Vehicle Service Information

Volvo 240D, 740D + 760D-Turbo



After-sales Service

Motor Vehicle Service Information

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VOLVO 240 - 2.4 D6

VDT-I-VOL 016 En

5.1979

with VE..FE.. distributor-type
fuel-injection pump

The Volvo 240 series, type 2.4 D6 is fitted with the VE..FE.. distributor type fuel-injection pump together with a mechanical part-load governor, automatic cold-start accelerator (KSB) and temperature-dependent idle enrichment (TLA). The pump is driven by a separate toothed belt from the camshaft.

Engine specifications

Water-cooled 6-Cyl. 4-stroke diesel engine with whirl chamber.
Engine output 60 kW (82 DIN HP) at a rated speed of 4800 min⁻¹,
Engine swept volume 2.38 l, firing order 1-5-3-6-2-4, compression 23:1.

Fuel-injection equipment

Vehicles with manually shifted transmission

Works model: 0 460 406 003 - VE 6/10 F 2400 L 32
(with VW-Audi company sign and
works-internal product number)

Aftermarket model: 0 460 406 004 - VE 6/10 F 2400 L 32 P
(without company sign and works
internal prod.-No.) filled with
oil as protection against corrosion.

Vehicles with automatic transmission

Works model: 0 460 406 009 - VE 6/10 F 2400 L 32-1
(with VW-Audi company sign and
works-internal product number)

Aftermarket model: 0 460 406 010 - VE 6/10 F 2400 L 32-1 P
(without company sign and works
internal prod.-No.) filled with
oil as protection against corrosion.

BOSCH

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N7

Motor Vehicle Service Information

Volvo 240D, 740D, + 760D-Turbo



Fuel filter

Single-stage box-type filter
(with water storage chamber
and outlet screw) 0 450 133 015 - FJ/DBR 1 W 6/6

Fuel-filter box 1 457 434 094

Nozzle-holder assembly

Nozzle-and-holder assembly 0 432 217 058 (works model)
0 432 217 059 (aftermarket model)

consisting of:

Nozzle-holder assembly 0 432 211 041 - KCA 30 SD 27/4

Nozzle 0 434 250 063 - DN 0 SD 193

Opening pressure 130^{+5} gauge pressure

After-sales service instructions

After-sales service should be carried out in the usual manner on these VE...F...-distributor-type fuel-injection pumps. The necessary technical documentation has been issued. Because of the special features "automatic cold-start accelerator (KSB)" and "temperature-dependent idle enrichment," a new edition of the Test and Repair Instructions will be issued. Until the test values appear on microfiche WP-..., the provisional test values can be obtained, if required, from the appropriate representative in your country.

Tools required for repairing and testing

The normal tools for the VE...-distributor-type fuel-injection pumps should be used.

In addition 3 extra KD tools are required:
(see catalog sheet KD-EP 10 En of 4.79)

Mounting device KDEP 1109
(for dismantling and mounting
the control device)

Pin wrench KDEP 1110
(for loosening and tightening
the threaded ring in the
control device)

Closure piece KDEP 1111
(for the leakage test of
the control device)



Exchange pump

The distributor-type fuel-injection pumps 0 460 406 004 and 0 460 406 010 have been included in the exchange program with index 090.

Adjusting the pump to the engine

The adjustment of this distributor-type fuel-injection pump is carried out according to the dial-indicator method.

To do this the automatic cold-start accelerator (KSB) must be switched off, i.e. the KSB control lever must lie against the stop bracket. To do this loosen the fillister-head screw (clamping screw) on the intermediate piece, press the KSB control lever in the direction of the distributor head, pull the intermediate piece out, turn it 90° and push it onto the clamping piece. Release the KSB control lever and press against the stop bracket.

To be sure that the timing-device piston is in the 0-position, the engine must be turned half a revolution in the direction of rotation.

Setting point

Pump: At a plunger lift of 0.70 mm after TDC
Engine: TDC marking cylinder 1 on the flywheel

When the adjustment has been carried out, bring the intermediate piece back into the basic position and tighten the fillister-head screw.

Detailed installation and dismantling instructions will be made known in a Service Information.

Please make every effort to ensure that your workshop carries out impeccable and speedy repair work on the fuel-injection system of these vehicles.



After-sales Service

Motor Vehicle Service Information

Only for use within the Bosch organization Not to be communicated to any third party

VOLVO 240-2.0 D 5
fitted with VE..F..-
distributor-type fuel-injection pump

VDT-I-VOL 018 En
8.1979

The Volvo 240 Series, Type 2.0 D 5 is fitted with the VE..F..- distributor-type fuel-injection pump with mechanical part-load governor, electromagnetic shutoff device, automatic cold-start accelerator (KSB) and temperature-dependent idle-speed increase (TLA). Drive is through a toothed belt from a separate drive wheel on the camshaft.

Engine data

Water-cooled, 5-cyl. 4-stroke diesel engine with whirl chamber.
Power: 50 kW (68 DIN HP) at rated speed 4,800 min⁻¹, swept volume 2.0 l, firing sequence 1-2-4-5-3, compression 23:1.

Fuel-injection equipment

Distributor pump (Vehicles with manual-shift transmission)	O 460 405 005 - VE 5/10 F 2400 L45	(Works model with VW- Audi trade mark and works-internal prod- uct number)
	O 460 405 006 - VE 5/10 F 2400 L45 P	(Trade model without VW-Audi trade mark, filled with oil as corrosion protection)
Distributor pump (Vehicles with automatic trans- mission)	O 460 405 007 - VE 5/10 F 2400 L45-1	(Works model with VW- Audi trade mark and works-internal prod- uct number)
	O 460 405 008 - VE 5/10 F 2400 L45-1P	(Trade model without VW-Audi trade mark, filled with oil as corrosion protection)

Fuel filter

Single-stage box-type filter	O 450 133 015 - FJ/DBR 1 W 6/6	(With water-separator chamber and drain screw)
Fuel-filter box	1 457 434 094	

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N10

Motor Vehicle Service Information

Volvo 240D, 740D, + 760D-Turbo



Nozzle-holder assembly

Nozzle-and-holder	O 432 217 058	(Works model)
assembly	O 432 217 059	(Trade model)

Comprising:

Nozzle-holder assembly O 430 211 041 - KCA 30 SD 27/4

Nozzle O 434 250 063 - DN 0 SD 193

Opening pressure 130⁺⁵ bar gauge pressure

See Microfiche for complete Bosch equipment.

Notes on servicing

After-sales service will be provided for this VE..F.- distributor pump in the usual manner. The appropriate technical documentation has already been published. Due to the special facilities "automatic cold-start accelerator (KSB)" and "temperature-dependent idle-speed increase (TLA)", particular attention must be paid to the Testing and Repair Instructions VDT-W-460/302 En and VDT-W-460/102 En.

Tools for repair and testing

The conventional tools are used as for the VE..- distributor pumps.

In addition, 3 further service tools are required:
(see Catalog sheet KD-EP 10 En from 4.1979)

Assembly tool	KDEP 1109	(For disassembly and assembly of the KSB/TLA control unit)
Pin wrench	KDEP 1110	(For loosening and tightening the threaded ring in the KSB/TLA control unit)
Plug	KDEP 1111	(For seal-testing the KSB/TLA control unit)

Exchange pump

The distributor pumps O 460 405 006 and O 460 405 008 have been given the Index No. 090 and included in the exchange program.



Timing the pump to the engine

The distributor pump is timed to the engine using the dial-indicator method.

In order to carry out timing, the automatic cold-start accelerator (KSB) must be switched off, that is, the KSB control lever must be up against the stop bracket. To do this, loosen the fillister-head screw (clamping screw) on the intermediate piece, push the KSB control lever towards the hydraulic head, release the intermediate piece, turn it through 90° and slide it onto the clamping piece. Now let go of the KSB control lever and push it up against the stop bracket.

To ensure that the timing-device piston is in the 0 position, the engine must be turned through at least half a revolution in the direction of rotation.

Timing point

Pump: At a plunger stroke of 0.80 mm after TDC
Engine: TDC marking for 1st cylinder on flywheel.

After timing has been completed, place the intermediate piece in its original position and tighten the fillister-head screw.

Detailed instructions as regards removal and installation will be published in the near future.

Please make every effort to ensure that your workshop carries out excellent repair and service work on the fuel-injection system of these vehicles.



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